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THESIS

COMPARATIVE COST ANALYSIS OF P-3 ACTIVE AND RESERVE AVIATION FORCES: THE ECONOMICS OF PROPOSED FORCE MIX ALTERNATIVES

by

Michael Richard Wrinkle

and

Carl Eugene Carson III

JUNE 1991

Thesis Advisor: Jerry McCaffery

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Comparative Cost Analysis of P-3 Active and Reserve Aviation Forces: The Economics of Proposed Force Mix Alternatives

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requirements for the degree of

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JUNE 1991

ABSTRACT

This thesis describes a methodology for estimating the annual operating and support costs of similarly equipped active and reserve VP squadrons. The costs analyzed include expenditures for personnel, equipment and support associated with maintaining a VP capability. A costing methodology developed by the RAND corporation provided the basis for developing the cost comparisons. The annual cost of the reserve VP squadron ($14.6 million) was found to be 44.5% of the cost of the active squadron. An annual savings of over $18.2 million results when a reserve squadron replaces an active squadron. The primary recurring cost factors that drive the annual costs of active and reserve VP squadrons and contribute to cost differentials are identified and discussed. Realization of cost savings are valid only for marginal changes in the total VP force. The total cost implications of large VP force mix changes, as currently proposed by DoD and the DoN, are addressed.

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TABLE OF CONTENTS

I. INTRODUCTION 1
  A. BACKGROUND 1
  B. PRIMARY RESEARCH QUESTIONS 3
  C. APPROACH 6
II. ORGANIZATIONAL RELATIONSHIPS 7
  A. NAVAL RESERVE 7
  B. RESERVE FORCE INTEGRATION 9
  C. CURRENT MARITIME PATROL (VP) STRUCTURE 12
III. ANNUAL OPERATING AND SUPPORT COSTS OF ACTIVE AND RESERVE P-3 UNITS: THE COST MODEL AND ANALYSIS 15
  A. THE METHODOLOGY 15
  B. PERSONNEL COSTS 19
    1. USN Pay and Allowances 19
    2. USN and USNR Military Retirement 21
    3. USN Flight Pay 22
    4. SELRES Pay and Allowances 23
    5. SELRES Other Pay Factors 25
    6. SELRES Accumulation of Costs and Retirement Accrual 25
    7. SELRES Additional Drills 27
    8. TAR Pay and Allowances 29
    9. Summation of Pay and Allowance Factors 30
  C. OTHER PERSONNEL AND BASE SUPPORT COSTS 31
    1. Other Personnel Costs 31
    2. Base Operating and Support Costs (BOS) 33
    3. Medical Cost Allocation to BOS 36

D. REPLACEMENT ACQUISITION AND TRAINING COST 37
  1. Enlisted Acquisition and Training Costs 39
  2. Officer Acquisition and Training Costs 40
  3. Officer Initial Flight Training Costs 42
  4. FRS Flight Training Costs 43
  5. FRS Simulator Costs 43
  6. Turnover Factors 45
  7. Special Active Duty 46
E. EQUIPMENT OPERATING COSTS 48
  1. Training Ordnance 50
  2. Modifications 50
  3. Scheduled Depot Level Maintenance 51
  4. POL, Maintenance Material, Replenishment Spares 52
  5. Depot Level, Engines and Component Costs 54
F. FINAL COMMENTS 55
IV. ANALYSIS OF PROPOSED P-3 ACTIVE/RESERVE FORCE MIX ALTERNATIVES 59
A. INTRODUCTION 59
B. NON-RECURRING COSTS 60
  1. Reprogramming Use or Destruction of Vacant Facilities 63
  2. Divestment of Unit Equipment 63
  3. Divestment Costs of Personnel 63
  4. Divestment Costs of Personnel Training 64
  5. Other - Secondary Force Wide Costs 64
C. FORCE MIX ALTERNATIVE I (20 ACTIVE/13 RESERVE SQUADRONS 67
  1. Assumptions 67
  2. Analysis Procedure 68
D. FORCE MIX ALTERNATIVE II (18 ACTIVE/9 RESERVE SQUADRONS) 71

E. FORCE MIX ALTERNATIVE III (13 ACTIVE/13 RESERVE SQUADRONS) 73
V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS . . . 78
A. SUMMARY 78
B. CONCLUSIONS 79
C. RECOMMENDATIONS 81
1. For Navy Policy 81
2. For Future Research 84
APPENDIX: GLOSSARY 86
LIST OF REFERENCES 88
INITIAL DISTRIBUTION LIST 93

LIST OF TABLES

TABLE 1. NAVY P-3 ACTIVE/RESERVE SQUADRON OPERATING AND SUPPORT COST COMPARISON 8 PAA ($ FY-90) 18

TABLE 2. NAVY PERSONNEL PER CAPITA COST FACTOR SUMMARY FOR VP ACTIVE AND RESERVE SQUADRONS ($ FY-90) 19

TABLE 3. USN PERSONNEL PAY AND ALLOWANCE FACTORS ($ FY-90) 20

TABLE 4. NAVY PERSONNEL END STRENGTH, FY-90 21

TABLE 5. RETIREMENT ACCRUAL FOR FY-90 ACTIVE DUTY AND SELRES 22

TABLE 6. USN FLIGHT PAY FACTORS ($ FY-90) 23

TABLE 7. USN TOTAL PAY FACTORS PER CAPITA ($ FY-90) 24

TABLE 8. SELRES AVERAGE DAILY PAY FACTORS (ACDUTRA AND DRILLS) ($ FY-90) 25

TABLE 9. SELRES OTHER PAY AND ALLOWANCE FACTORS ($ FY-90) 26

TABLE 10. SELRES PAY AND ALLOWANCE FACTORS SUMMARY EXCLUDING ADDITIONAL DRILLS ($ FY-90) 26

TABLE 11. SELRES COST FACTORS FOR ADDITIONAL DRILLS ($ FY-90) 28

TABLE 12. SELRES TOTAL PAY AND ALLOWANCE FACTORS ($ FY-90) 28

TABLE 13. USNR TAR PAY AND ALLOWANCE FACTORS ($ FY-90) 29

TABLE 14. P-3 SQUADRON AVERAGE PERSONNEL STRENGTH 30
TABLE 15. OTHER PERSONNEL AND BASE OPERATING AND SUPPORT COST SUMMARY ($ FY-90) 32
TABLE 16. USN OTHER PERSONNEL COST FACTORS (PCS) ($ FY-90) 32
TABLE 17. USNR OTHER PERSONNEL COST FACTORS ($ FY-90) 33
TABLE 18. USN BASE OPERATING AND SUPPORT COST FACTORS ($ FY-90) 35
TABLE 19. USNR BASE OPERATING AND SUPPORT COST FACTORS ($ FY-90) 35
TABLE 20. ALLOCATION OF USN AND USNR MEDICAL COSTS ($ FY-90) 37
TABLE 21. NAVY REPLACEMENT ACQUISITION AND TRAINING COST SUMMARY ($ FY-90) 38
TABLE 22. ACQUISITION AND TRAINING COSTS FOR NAVY ENLISTED PERSONNEL ($ FY-90) 40
TABLE 23. NAVY OFFICER ACQUISITION PROJECTIONS AND COSTS 41
TABLE 24. NAVY OFFICER ACQUISITION AND TRAINING COSTS ($ FY-90) 42
TABLE 25. PILOT AND NFO FRS TRAINING COST ESTIMATES ($ FY-90) 44
TABLE 26. NAVY PERSONNEL TURNOVER FACTORS 45
TABLE 27. SELRES OTHER TRAINING COST (SPECACDUTRA) FACTOR ($ FY-90) 48
TABLE 28. NAVY P-3 AIRCRAFT EQUIPMENT COST FACTORS ($ FY-90) 49
TABLE 29. ALLOCATION BASED ON PERCENTAGE OF AIRCRAFT ($ FY-90) 51
TABLE 30. USN FY-90 SDLM COSTS 52
TABLE 31. USN CALCULATION OF POL, MATERIAL, AND SPARE COSTS ($ FY-90) 53

TABLE 32. FY-90 T56 ENGINE AND P-3 COMPONENT COST 55
TABLE 33. NAVY P-3 ACTIVE/RESERVE SQUADRON OPERATING AND SUPPORT COST COMPARISON 8 PAA ($ FY-90) 56
TABLE 34. PRIMARY P-3 NON-RECURRING COST ELEMENTS IN A DECLINING FORCE MIX ATMOSPHERE 62
TABLE 35. ALTERNATIVE I FORCE MIX: SUMMARY OF ESTIMATED OPERATING AND SUPPORT COSTS. ($ FY-90) 69
TABLE 36. AIRCRAFT EQUIPMENT COST FACTORS FOR ALTERNATIVE I. ($ FY-90) 70
TABLE 37. ALTERNATIVE I PROJECTED ANNUAL COST SAVINGS ($ FY-90) 70
TABLE 38. COST SAVINGS OF ALTERNATIVE I DISCOUNTED AT 4% (FY-92 TO FY-96) ($ FY-90) 71
TABLE 39. ALTERNATIVE II: PROJECTED ANNUAL COSTS SAVINGS ($ FY-90) 72
TABLE 40. COST SAVINGS OF ALTERNATIVE II DISCOUNTED AT 4% (FY-92 TO FY-96) ($ FY-90) 72
TABLE 41. OP-05R TAR MANNING ESTIMATES 74
TABLE 42. ALTERNATIVE III FORCE MIX: SUMMARY OF ESTIMATED OPERATING AND SUPPORT COSTS ($ FY-90) 75
TABLE 43. ALTERNATIVE III: PROJECTED ANNUAL COST SAVINGS ($ FY-90) 76
TABLE 44. COST SAVINGS OF ALTERNATIVE III DISCOUNTED AT 4% (FY-92 TO FY-96) ($ FY-90) 76
TABLE 45. ALTERNATIVE I, II, AND III COST SAVINGS PROJECTION SUMMARY ($ FY-90) 77

LIST OF FIGURES

Figure 1. Cost Comparison of P-3 Active and Reserve Squadrons ($ Millions FY-90) 80
Figure 2. Projected Cost Savings for Each of the Proposed VP Force Mix Alternatives 82

I. INTRODUCTION

A. BACKGROUND

> The Committee [House of Representatives Defense Subcommittee] and Congress truly believe that during a period of decreasing defense budgets, it makes sense to put more, not less, force structure into the reserve components. Manpower requirements to support operation Desert Shield could not have been accomplished without the reserve components. Unless the United States decides to reinstate the draft, it is more important than ever that a highly trained, readily available National Guard and Reserve force be maintained. [Ref. 1]

With these strong words directed at Secretary of Defense Richard B. Cheney in a recent personal letter, Representative John P. Murtha reiterated Congress' renewed and increased interest in the role of our Reserve and National Guard units in the Total Force approach to meeting future force structure requirements. This interest was triggered by steadily rising defense budgets, declining resources and unpredictable changes in the threats to our national security.

"Since its adoption in 1973, the Total Force Policy has provided the DoD with an integrated force of active, reserve, retired military, federal, civilian, and contractor personnel [Ref. 2:p. 2]." The major objective of the Total Force Policy has been to maintain as small an active peacetime force as national security policy, military strategy, and overseas commitments permit, and to integrate the capabilities and strengths of active and reserve components in a cost-effective manner. The Total Force concept was reaffirmed by Secretary of Defense Caspar Weinberger in 1982 when he said, "We can no longer consider reserve forces as merely forces in reserve ... instead, they have to be an integral part of the total force. Only in that way can we achieve the military strength that is necessary to defend our freedom [Ref. 3:pp. 7-8]."

In 1983, faced with an increasingly stringent defense budget, Congress directed that each service provide for greater Reserve participation in the active duty mission. A new Assistant Secretary of Defense for Reserve Affairs was created to foster this move, and reserve forces were subsequently assigned to more demanding wartime missions and to fill additional critical peacetime operational responsibilities. To date, efforts to integrate Reserve forces into many of the missions traditionally performed by active-duty personnel - the most costly manpower asset - have proven very successful. Of particular note, the Navy has placed a significant percentage of its antisubmarine warfighting capability in the Naval Reserve. Currently 35% of all maritime patrol (VP) squadrons are run exclusively by the Reserves who augment their active-duty counterparts in the continental United States (CONUS), and various deployed sites in the Atlantic and Pacific.

While the ability to expand the scope of the U.S. Navy through the use of Reserve forces remains an important strategy in maintaining a formidable military posture across the oceans, a new Reserve initiative has rapidly gained significance.

In light of the dramatic geopolitical changes that have taken place in Eastern Europe and the Middle East during the past year, the need for large U.S. forces that can fight on short notice has apparently diminished. Retaining forces in the reserve components rather than on active-duty has become an attractive option to Congress because of the widely perceived notion that reserve force units have considerably lower operating costs than comparable active units. In a speech before Congress on April 20, 1990, Senator Sam Nunn talked of a new military strategy that called for the greater utilization of the Reserves as a cost saving step. In terms of Navy aviation, he specifically conveyed that:

> ....Currently a third of the P-3 fleet is operated by reserve units. By most accounts, they perform the ASW mission very well, even though they are given the oldest and least capable aircraft. Transferring modern P-3's to Navy Reserve P-3 squadrons and deactivating some active squadrons could save between $1.5 and $1.8 billion over five years. [Ref. 4]

On October 26, 1990, under the political dark clouds of runaway spending, a record budget deficit exceeding $360 billion and a weakened economy, the conferees of the FY-91 National Defense Authorization Act made the following unprecedented commitment to the nation's Reserve and National Guard forces in light of the fiscal constraints we face:

> A total of $1.9 billion is authorized for new equipment for National Guard and Reserve Forces, $1.4 billion above the amount requested in the budget. The conferees maintained the force structure and personnel strength of the Reserve components at the current levels for fiscal year 1991, rather than making the reductions called for in the budget request. The conferees directed increased Reserve participation in several mission areas, including antisubmarine warfare and tactical airlift. Finally the conferees instituted a program to integrate more active duty personnel into the day-to-day training and management of Reserve component forces beginning in fiscal year 1992. [Ref. 5]

B. PRIMARY RESEARCH QUESTIONS

In the past, it was generally assumed that transferring forces and missions to the Reserves would always result in substantial savings due to lower personnel and operating costs. However, experience has shown that the precise magnitude of the cost differential will vary according to the manning level, mission, and operating tempo of the units in question. For example, while the maritime patrol mission of the P-3 Active and Reserve forces remain nearly the same, the part time status of Reserve personnel cannot allow for the same level of output. A few cost studies were conducted in the mid-1980s to verify the extent of these cost reductions. A 1985 RAND study indicated that maintaining a carrier air wing in the Reserve costs about 54% of the cost of an active air wing - a 46% savings. Conversely, maintaining a reserve frigate costs approximately 86% of the cost of maintaining an active frigate - a 14% savings [Ref. 6]. Unfortunately, past studies of active and reserve force units suffered from unsuitable or incomplete data deficiencies which resulted in a degradation of critical cost factors needed in making force mix decisions.

The idea of identifying, for cost comparison, Active and Reserve VP units with nearly identical missions appeared reasonable and timely in view of recent mandates to downscale the VP community. In developing the cost comparison, several qualifying assumptions were required. First, there could be no degradation in quality of work performed between the VP Reserve and Active forces. While some controversy exists over this issue of combat readiness, recent classified readiness data indicates that the readiness of Naval Air Reserve squadrons is on par with that of fleet squadrons [Ref. 3:p. 11]. The second assumption is that both forces are similarly manned, equipped, and have similar wartime missions. In most of the cases examined, active and reserve units were manned at, or near, full authorization levels. All units were found to be operating with eight P-3 aircraft, and although the active forces utilize predominantly P-3C models against the reserve P-3B models, we consider this difference negligible. In terms of wartime missions it was determined that the reserve units may not have quite the full range of operational capabilities as their active counterparts (such as HARPOON).

However, we dismissed this on the grounds that the majority of reserve personnel are prior-service, and have received extensive active duty training in the few types of missions lacking in the reserve units. Finally we have expressed all costs in FY-1990 dollars. Other than actual FY-1990 data was converted to the FY-1990 base using published service-generated indexes. Given these conditions, the primary research questions are:

1. How would a Navy analyst or planner define the annual recurring operating and support costs of active and reserve force P-3 aviation units? Where would he or she go to obtain historical and present cost data?

2. What cost methodology would best provide Navy analysts with a framework for estimating P-3 annual unit costs?

3. What are the primary recurring cost factors that drive the annual costs of active and reserve force units and contribute to resulting cost differentials?

4. Do reserve force P-3 squadrons have considerably lower annual recurring costs than comparably equipped active squadrons? If so, what reserve costs typically realize a savings advantage over the active units?

5. Given the recent Navy and DoD proposals to downscale the VP active/reserve mix from the current status of 24 active/13 reserve squadrons to either (1) 18 active/9 reserve or (2) 13 active/13 reserve squadrons, which alternative would be the most economically efficient?

6. Will a cost comparison alone suffice as a basis for adequately addressing the total cost implication of large force mix changes such as those being currently proposed by the Navy and DoD? If not, what are some of the additional non-recurring costs associated with unit changes that must be included to provide a complete cost analysis suitable for force mix decisions?

Answers to these research questions will be clearly discernible to the reader in the ensuing Chapters II through V.

C. APPROACH

The methodology for this cost analysis will begin with an existing cost model developed by the RAND Corporation which used active/reserve F-4 squadrons as its base. The model will be modified to adequately assess active/reserve VP costs with suitable and consistent inputs obtained from official published service documents and professional organizations in most cases. The model will present a framework for estimating annual unit costs, and any cost differences that show significant variation will be analyzed and discussed. The model will combine operating and support costs in a series of simple linear equations. Appropriate discounting techniques will be employed to determine the multiyear cost savings for each of the proposed Navy and DoD force mix alternatives. This cost comparison will not attempt to validate the RAND Corporation's costing approach, but it will provide evidence to support and contribute to future VP active/reserve policymaking decisions.

The remainder of this thesis will examine Reserve force integration and current maritime patrol (VP) structure (Chapter II), VP Active/Reserve cost estimates and cost comparisons based on current and proposed force mix alternatives (Chapters III and IV), and will conclude with a discussion of the findings and recommendations of the cost analysis (Chapter V). An appendix at the end of the thesis provides a glossary of commonly used Naval Reserve terms to assist the reader in the understanding of the Reserve force structure.

II. ORGANIZATIONAL RELATIONSHIPS

A. NAVAL RESERVE

The Naval Reserve was established on March 3, 1915. From World War I to the present the Naval Reserve has played a key role in both peacetime and periods of domestic and international conflict. "In World War II, approximately 75 percent of the Officers and Enlisted men who served on active duty with the Navy were Reservists [Ref. 2:p. 14]." Since 1953, U.S. Naval Reserve forces have been called to active duty for international crises on several occasions, including the current call-up for Operation Desert Shield. Today, the Naval Reserve has grown to more than 773,000 men and women.

The Reserve Force structure can be broken into two separate groups. The largest of these is the Ready Reserve, while the second group consists of those personnel who are Retired or Standby Reservists. The Ready Reserve is composed of the two most combat-ready elements - the Active Duty Reservists and Inactive Duty Reservists. Active Duty Reservists are those career-oriented TAR (Training and Administration of Reserves) military personnel whose specialty is the administration and training of drilling Reservists. TARs are full-time officers and enlisted personnel who run the Reserve program on a daily basis. The Inactive duty segment of the Ready Reserves is comprised of two key groups: drilling Selected Reserves (SELRES) personnel, and those in the Individual Ready Reserve (IRR). [Ref. 3:p. 3]

From the TAR and Selected Reserve categories come the personnel who comprise the personnel cost factors for the Reserve half of the cost analysis. Selected Reserve personnel are the heart and soul of the entire Naval Reserve program. These "citizen sailors" are the often called "weekend warriors" who are required to perform four drills (four hour work periods) per month and at least two weeks (12 days) of Active Duty for Training (ACDUTRA) per year. "Most of the all volunteer SELRES personnel are Navy Veterans who continue their affiliation with the Navy while, at the same time, pursuing their civilian careers." [Ref. 3:p. 4]

Many reservists like to perform "additional drills" beyond the minimum prescribed. These drills, in addition to the required four per month, are authorized for those individuals who desire or require more time to maintain proficiency in high skill areas. Reserve pilots, for example, often perform up to 48 additional drills per year. Special Active Duty, which is active duty performed in excess of the two week annual requirement, is often used by these same reservists who wish to enhance specialty skills or assist the TARs in the administration of squadron operations.

During the weekday periods when the SELRES are active in their civilian careers, TAR personnel keep the programs and equipment operating. They are analogous to a highly trained pit crew who provide daily continuity and expert skills to the Reserve program vehicle. They are the administrators and custodians of the Naval Reserve Community.

Important to note is the projected growth of these two groups: SELRES personnel strengths are planned to remain at an end-strength of approximately 130,692 through FY-92. TAR personnel (the most costly Ready Reserve personnel) are programmed to grow from 22,708 in FY-90 to 23,000 plus in FY-92. This planned expansion of TARs coincides with the increasing pressure from Congress to integrate more active duty personnel into the day-to-day operations of reserve units, and therefore to be able to transfer more missions to the Reserve Forces. [Ref. 5]

B. RESERVE FORCE INTEGRATION

> The Conference Report on the FY-84 Defense Authorization Bill asked the Services to provide the Armed Services Committees of the Senate and House of Representatives with an annual report outlining changes that will be accomplished to provide the Guard and the Reserves with: new missions, more modern equipment, and greater integration with the active forces. [Ref. 7]

In this statement, former Secretary of the Navy John Lehman referred to Congress' increased interest in reducing defense spending through greater use of the "perceived" less costly Reserve Armed Forces. Although initially skeptical that transferring missions to the Reserves in all cases would actually save money, Lehman still committed the Navy to a growth and modernization of the Naval Reserve Forces. "Since 1980, Selected Reserves end-strength has grown by over 50 percent. By comparison, during the same period, Active Duty end-strength increased 15 percent. On the modernization side, consistent with its policy of horizontal integration, the Navy has placed front-line weaponry in the Naval Reserve, including the F/A-18, modern frigates, P-3C Update III's, and HH-60H helicopters." [Ref. 3:p. 4]

In the last ten years, the Navy has also placed a significant percentage of its warfighting capability in the Naval Reserves. With increased warning times due to the declining Soviet threat, there will no doubt be greater future emphasis on shifting more forces and missions from the active to the reserve components. The Assistant Secretary of Defense for Reserve Affairs, Mr. Stephen Duncan, recently summed it up well when he testified before Congress:

> I believe that for cost reasons alone, a rebuttable presumption should exist that missions should be considered for assignment to the Reserve forces unless there are sound and apparent military reasons for assigning the mission to the Active forces. If the presumption can't be easily rebutted, then a particular mission would seem to be a prime candidate for assignment to the Reserve forces. [Ref. 4]

It is through this integration of the active and reserve components that the Navy receives its peacetime dividend on the investment made in manpower, training and modern equipment for the Naval Reserve. With the prospects of declining resources in the near future, it would appear logical that continued integration could yield significant cost saving dividends.

Two important issues must be considered, however, if Congress wishes to depend more heavily on Guard and Reserve forces now and into the future. These two issues are "availability" and "accessibility." Concern has been rightfully expressed that, although initial cost studies show a substantial savings when Reserve forces assume an active duty mission, further analysis has shown that the degree of participation by the Reserves will affect mission effectiveness and the amount of savings. Selected Reservists are an "all volunteer" force in the truest sense and there are definite bounds - civilian job and family related - on the time they can devote to their Navy duties. There would appear, therefore, to be some "practical limits" under the Total Force Concept, on the number of forces and missions which can be shifted from the active to the reserve component and still maintain an effective and balanced force structure.

The issue of accessibility of reserve personnel during peacetime remains an unresolved topic of debate and has been discussed in earlier Total Force Reports. Accessibility means the availability of reserve personnel to conduct operational missions in times of emergency. Under current law, the President has the authority to mobilize up to 200,000 members of the Selected Reserve for operational necessity for as long as 180 days (two 90-day periods). Presidents had been typically reluctant to use this authority until recently. President Bush, in a move to test the Total Force Policy and reassure military planners that reserve units are ready when needed, exercised the mobilization system by calling up 134,000 members of the Selected Reserve to participate in Operation Desert Shield [Ref. 2:p. 71]. Although this complex operation appears to have been one of the largest and most successful deployments in our nation's history, there remains some uncertainty associated with having to rely on volunteers to respond to contingencies.

Because this issue of accessibility remains in question, Navy planners and decision makers must consider the level of risk inherent in large force mix decisions resulting in all, or nearly all, of a specific capability being assigned to the Naval Reserve. Furthermore, in Chapter IV, when the cost implications of the Navy's and the DoD's proposed force mix alternatives are discussed, it will become clearly evident that large substitutions of Reserve for Active squadrons will also reduce the cost savings differential. In simple terms, if the reserve component must be manned and operated on a "full-time" basis in order for the Navy to meet its normal peacetime commitments, the savings normally expected from placing forces/missions in the Reserve will not be realized.

Chapter IV will examine VP active/reserve cost estimates and cost comparisons based on the annual recurring operating and support costs determined in Chapter III. The cost analysis will be appropriate for small changes in the current force, but may underestimate large changes in the mix of active and reserve VP units for several reasons. A few of those reasons - availability and accessibility - have already been discussed. The remaining reasons will be discussed in detail in Chapter V.

C. CURRENT MARITIME PATROL (VP) STRUCTURE

The total maritime patrol force is currently composed of 24 fleet squadrons and 13 reserve squadrons. With the CNO's imminent decommissioning of four fleet squadrons during FY-91, and the subsequent transfer of their P-3C aircraft to the Naval Reserves, a total of 20 fleet squadrons will be used as a base case in the fleet half of the comparative cost analysis. [Ref. 8]

All fleet and reserve VP squadrons are CONUS based, with the fleet squadrons being homeported at Moffett Field, California; Barbers Point, Hawaii; Jacksonville, Florida; and Brunswick, Maine. The primary missions of the fleet are to provide antisubmarine services for our Battle Groups, as well as to patrol the coastal waters of the United States. They also provide a variety of other services which include maritime patrol of the sea lanes, defensive mining operations, drug interdiction surveillance, and search and rescue missions.

To provide these services, the fleet squadrons each fly approximately 5,500 hours per year. The squadrons accomplish this with an authorized squadron manning level of 63 Officers and 274 Enlisted full-time personnel [Ref. 9]. In addition, each fleet squadron is authorized the use of eight P-3C aircraft to operate and maintain. Although two of the fleet squadrons based out of Hawaii still operate P-3B aircraft, for the purposes of this study

P-3C cost factors will be utilized. Only minor cost differences exist between the two models, and are considered to be insignificant.

Each fleet squadron deploys overseas on the average of six months out of each 18 month operational/training cycle. While deployed, the West Cost squadrons support Seventh Fleet ops out of Diego Garcia, Japan, Okinawa, Guam, and the Philippines. Third Fleet ops are supported from Adak, Alaska. Meanwhile, East Coast squadrons routinely support Sixth Fleet ops out of Spain, Italy, Iceland and Bermuda.

The 13 reserve VP squadrons are based coast to coast throughout the United States from Moffett Field, California, to Jacksonville, Florida. Their missions are identical to the fleets', but on a slightly smaller scale. Each reserve squadron flies approximately 3,500 hours per year with the same complement of eight P-3 aircraft. All reserve squadrons fly P-3B model aircraft with the exception of two squadrons which fly P-3C and P-3A models respectively. As fleet squadrons are decommissioned, the current plan is for them to transfer the updated P-3C aircraft to the reserves as part of the Total Force modernization plan. Again, for analytic purposes all reserve squadrons will be assumed to be operating eight P-3B aircraft.

To support their missions, the reserve squadrons are authorized a squadron manning of 81 Officers and 313 Enlisted personnel. Of these totals, only seven Officers and 105 Enlisted (or 28% of squadron personnel) are full-time active duty TARs [Ref. 10]. The remaining Officer and Enlisted corps are made up of drilling reservists (SELRES) [Ref. 9]. An interesting aspect of the reserve squadron organization is that on average, 11 out of the 13 squadrons are commanded by a SELRES Commanding Officer and

Executive Officer. In these cases the day-to-day management is performed by a TAR Officer-in-Charge.

The reserve squadrons recruit the majority of their SELRES personnel from the regular Navy P-3 community. Many of the pilots, Naval Flight Officers and Enlisted Aircrewmen acquired their skills and qualifications while serving out their active duty obligations. The SELRES Officer and Enlisted ground personnel recruited are also closely aligned in both professional experience and training background due to the commonality of working on the same basic aircraft. Each reserve squadron deploys overseas one month (two 14-day ACDUTRA periods) out of each year to augment their fleet squadron counterparts.

To form a meaningful cost analysis and comparison between an active and reserve squadron, the ensuing cost model needs to estimate costs of comparable units. Comparable units being defined as similar in manning, equipment and having the same wartime missions [Ref. 6:p. 5]. The closeness in unit structure, aircraft, and missions make the fleet and reserve P-3 squadrons ideal units for cost comparison and analysis. Secondarily, although both units differ slightly in tempo of operations, their similar geographic locations within CONUS, and similar fleet augmentation support sites makes them prime targets for further future Reserve force integration.

Chapter III will lay the groundwork for the P-3 Active/Reserve squadron comparative cost analysis study. All appropriate cost definitions, details and assumptions of the analysis will be reviewed and a framework for assessing the personnel, equipment and Base Operating Support (BOS) costs of each organization will be thoroughly developed.

III. ANNUAL OPERATING AND SUPPORT COSTS OF ACTIVE AND RESERVE P-3 UNITS: THE COST MODEL AND ANALYSIS

A. THE METHODOLOGY

In an attempt to achieve consistency and inclusiveness in costing, the core of this analysis uses a method of costing and comparison of active/reserve military forces developed and subsequently published by John F. Schank of the RAND Corporation in 1986 [Ref. 11:p. 2]. RAND was sponsored by the Assistant Secretary of Defense for Reserve Affairs to develop this methodology because of increasing interest in Congress to compare costs of similar active and reserve units [Ref. 11]. Mr. Schank stated that one of the objectives of his work would be for others to follow this methodology in costing Operating and Support Costs (O&S) for various military communities throughout the DOD. This costing methodology does not include certain life-cycle costs such as P-3 research and development costs and P-3 procurement costs because such costs are typically not a factor in active/reserve force mix decisions. These costs are considered "sunk" (irrelevant) for purposes of this cost analysis [Ref. 11:p. 2]. Schank's analysis took him to the Army, Navy, and Air Force where he conducted several case studies on various types of similar military units. The particular study by which this thesis was patterned was Schank's analysis of active and reserve Navy F-4S squadrons conducted in 1983. This was the logical model of choice since P-3 active and reserve squadrons are also Naval aviation units with similar infrastructures. However, due to the uniqueness of the P-3 community, several minor changes and deviations from Schank's model were necessary and will be highlighted throughout the analysis.

To begin the analysis the intended focus will be on FY-90 P-3 Operating and Support Costs (O&S). These costs are sometimes referred to as recurring costs, direct costs, semivariable, or variable costs. Annual Recurring (O&S) cost elements are separated into personnel-related costs and equipment-related costs based on actual FY-90 dollar outlays as determined by available data sources. The development of data sources and their references will be discussed further throughout this chapter. Finally, non-recurring or fixed one-time capital outlay costs which do not figure in this analysis will be discussed later in Chapter IV. As defined by Schank, O&S costs are divided into four major cost elements:

1. Personnel costs:
    - Pay and allowances
    - Military retirement accrual
    - Flight pay

2. Other personnel (PCS, travel, bonuses, death gratuities and hospitalization) and base support costs:
    - Base operations
    - Real property maintenance

- Medical facilities support

3. Acquisition and training of replacement personnel

4. Equipment operating costs:
    - Petroleum, oil, and lubricants
    - Ordnance
    - Maintenance supplies
    - Replenishment spare parts
    - Depot level maintenance
    - Modifications

The tables incorporated in this analysis go through each of the four major cost elements in arriving at per capita average cost factors and resource factors such as personnel strengths, equipment supplies and spare parts [Ref. 11:p. 8]. The resultant "cost factors" and "resource factors" were then inserted into a series of linear estimating equations to calculate the different elements of cost. In most cases the cost elements were estimated by multiplying a "resource factor" (e.g., number of personnel, pieces of equipment) by a "cost factor" (i.e., actual cost per resource factor), with the resultant total costs transferred to a final summary table (Table 1) where all costs were accumulated and totaled. This final summary table is displayed now, and at the end of this chapter to assist and guide the reader through the detailed analysis phase of the study.

TABLE 1. NAVY P-3 ACTIVE/RESERVE SQUADRON OPERATING AND SUPPORT COST COMPARISON
8 PAA
($ FY-90)

		USN	USNR	RATIO
I.	PERSONNEL COSTS PAY AND ALLOWANCES:			
	SELRES Officer	0	1,161,218	
	Active Duty Officer	4,222,056	484,400	
	SELRES Enlisted	0	1,028,660	
	Active Duty Enlisted	7,742,147	3,140,640	
	Total	11,964,203	5,814,918	48.6%
II.	OTHER PERSONNEL AND BASE SUPPORT COSTS:			
	Officer	607,257	347,853	
	Enlisted	2,234,744	1,030,313	
	Total	2,842,001	1,378,166	48.5%
III.	REPLACEMENT ACQUISITION AND TRAINING COSTS:			
	Pilot	4,568,924	0	
	Naval Flight Officer	1,551,799	0	
	Non Flight-Rated Officer	27,531	22,940	
	Enlisted	1,172,353	142,061	
	Special Active Duty Training	0	271,826	
	Total	7,320,607	436,827	6.0%
IV.	EQUIPMENT OPERATING COSTS:			
	POL	3,458,432	1,307,736	
	Maintenance supplies	1,040,000	832,840	
	Replenishment spares	1,314,286	1,325,456	
	Depot maintenance	2,266,278	2,147,916	
	Modifications	1,073,493	1,047,006	
	Ordnance	1,599,208	343,726	
	Total equipment	10,751,697	7,004,680	65.1%
	Total unit costs	**32,878,508**	**14,634,591**	**44.5%**

B. PERSONNEL COSTS

Personnel costs for both the USN and USNR components of the Navy are comprised of regular pay and allowances entitlements, military retirement accruals, flight pay allowances and miscellaneous other pay allowances as defined later in this section. Table 2 provides the reader with an upfront composite summary of the VP active duty Officer and Enlisted per capita personnel costs as compared with their VP reserve counterparts. Just how these per capita costs were derived is explained in detail in the remaining part of this section.

TABLE 2. NAVY PERSONNEL PER CAPITA COST FACTOR SUMMARY FOR VP ACTIVE AND RESERVE SQUADRONS ($ FY-90)

	FLIGHT RATED	NON-FLIGHT RATED
OFFICER		
USN Active Duty (from Table 7)	67,284	61,672
SELRES (from Table 12)	15,969	10,847
TAR (from Table 13)	69,200	69,200
ENLISTED		
USN Active Duty (from Table 7)	29,835	27,418
SELRES (from Table 12)	5,936	4,190
TAR (from Table 13)	29,568	29,568

- *Active rated personnel receive flight pay.*
  SELRES (part time) factors include additional drills
- *For definition of the terms TAR, SELRES, and USN Active Duty see GLOSSARY*

1. USN Pay and Allowances

The first step in deriving Table 2 was to arrive at a per capita pay figure for non-flight USN Officers and Enlisted personnel. The basic procedure involved gathering appropriate pay data from the NMPC-711 Navy Manpower Budget Office headed by Mr. Don Cunningham [Ref. 12]. An impressive array of data (as shown in Table 3), represents the total pay and allowance dollars expended on personnel in FY-90. Total pay and allowances approximated \$3.4 and \$10.7 billion for Officer and Enlisted personnel respectively.

TABLE 3. USN PERSONNEL PAY AND ALLOWANCE FACTORS ($ FY-90)

	OFFICER	ENLISTED
PAY AND ALLOWANCES		
Basic pay	2,360,431,000	6,948,984,000
Quarters	350,437,000	1,024,535,000
Housing, VHA	139,703,000	352,825,000
Subsistence	106,786,000	912,068,000
Incentive (less flight pay)	32,172,000	102,834,000
Special (less flight pay)	154,979,000	374,172,,000
Allowances	45,094,000	306,353,000
Separation, Family	3,228,000	24,692,000
Social Security	214,883,000	643,266,000
Other, Misc., Death, Survivors Benefits, Education	2,522,000	38,393,000
.... Total	3,410,235,000	10,728,117,600
Strength (from Table 4)	72,090	502,530
Pay per capita ($)	47,298	21,348

Source: NMPC-711

These total dollars were then divided by total FY-90 USN end strength figures (Table 4) to arrive at the bottom line per capita figures for USN Officers and Enlisted personnel. End strength data was obtained from OP-130, OP-130C, OP-132C, NMPC-711, CNARF, and the Office of Civilian Personnel [Refs. 13, 14, 15, 16, 17, 18].

TABLE 4. NAVY PERSONNEL END STRENGTH, FY-90

	USN	USNR
PAY GROUP A		
Officer	72,090	26,919
Enlisted	502,530	96,744
FLIGHT-RATED		
Officer	19,215	4,270
Enlisted	6,551	961
CIVILIAN	308,088	2,409
TAR		
Officer	0	2,340
Enlisted	0	20,332

Source: OP-130, OP-130C, OP-132C, NMPC-711, CNARF Office of Civilian Personnel

2. USN and USNR Military Retirement

The next step was to calculate military retirement for USN and USNR personnel. Schank did not include military retirement in his analysis of Navy F-4S squadrons because he felt it did not change the overall cost ratio significantly in units that are heavy in hardware. Retirement is generally a smaller portion of overall costs in a capital intensive unit such as an aviation squadron [Ref. 11:p. 37]. Schank found the effects of including retirement to be greater in personnel intensive units such as an Army unit [Ref. 11:p. 37].

Also, in 1983 DOD was not yet accruing costs for retirement as part of the personnel costing equation. Nevertheless, this P-3 analysis does include retirement costs as part of the personnel cost equation (DOD began officially accruing retirement pay in 1985). Retirement accrual percentages for FY-90 were obtained from NMPC-711, Mr. Don Cunningham. These percentages were developed by the DOD Office of the Actuary [Ref. 19], and accrued as a percentage of basic pay. The duel accrual for FY-90 was 43.9% for active duty and 13.4% for SELRES. Based on these percentages Table 5 was developed.

TABLE 5. RETIREMENT ACCRUAL FOR FY-90 ACTIVE DUTY AND SELRES

	OFFICER	**ENLISTED**
ACTIVE DUTY		
Basic Pay (from Table 3)	2,360,431,000	6,948,984,000
Retirement Accrual %	43.9%	43.9%
. . . . Total Retirement	1,036,229,209	3,050,603,976
End Strength (from Table 4)	72,090	502,530
Per Capita Retirement	14,374	6,070
SELRES		
Basic Pay Per Capita (from Table 8)	8,612	3,195
Retirement Accrual %	13.4%	13.4%
Per Capita Retirement	1,154	428

Source: NMPC-711

3. USN Flight Pay

Since the majority of Officers and a large part of Enlisted personnel in the P-3 community are flight-rated, a per capita flight pay factor had to be developed. Table 6 summarizes the USN per capita flight pay calculations. The

FY-90 total flight pay figures were obtained from NMPC-711, Mr. Don Cunningham [Ref. 12]. As a special note, in Schank's study of Navy F-4S squadrons, he also calculated a per capita figure for sea pay because of the large percentage of personnel who qualified for it based on the amount of sea duty required in F-4S squadrons [Ref. 11:p. 109]. P-3 squadron personnel, on the other hand, usually do not qualify for sea pay and thus it was omitted from the calculations.

TABLE 6. USN FLIGHT PAY FACTORS
($ FY-90)

	OFFICER	ENLISTED
Total flight pay	107,834,000	15,831,000
Number of flight-rated (from Table 4)	19,215	6,551
Cost per capita	5,612	2,417

Source: NMPC-711

At this point, all the information needed to calculate the final USN pay and allowance factors in Table 7 can be obtained from data in Tables 3, 5, and 6. Final Table 7 totals are then transferred to Table 2 (Navy Personnel Cost Factor Summary) as shown earlier in the chapter.

4. SELRES Pay and Allowances

Attention now swings to the calculation of the SELRES pay and allowances. Reserve pay is usually broken down by an average cost per day for all ranks of officers and enlisted personnel. These costs per day are then multiplied by participation rates which are calculated each fiscal year based on historical data. The FY-90 costs per day and participation rates were obtained from Mr. Ed Tweedy at the Chief of Naval Air Reserve Forces

TABLE 7. USN TOTAL PAY FACTORS PER CAPITA
($ FY-90)

	OFFICER	ENLISTED
FLIGHT-RATED PERSONNEL		
Pay and allowances per capita (from Table 3)	47,298	21,348
Flight pay per capita (from Table 6)	5,612	2,417
.... Total	52,910	23,765
Retirement (from Table 5)	14,374	6,070
.... Total	67,284	29,835
NON FLIGHT-RATED PERSONNEL		
Pay and allowances (from Table 3)	47,298	21,348
Retirement (from Table 5)	14,374	6,070
.... Total	61,672	27,418

Headquarters (CNARF) located in New Orleans, Louisiana [Ref. 20]. Furthermore, the average SELRES pay must be multiplied by the required number of "drills" specified per year to receive credit for retirement purposes. There are two ways in which the SELRES earn these drills. First, each SELRES is required to participate in two weeks (14 days) of active duty training (ACDUTRA) each fiscal year. Second, most reserve units train (in addition to ACDUTRA) one weekend a month where they are credited with two drills for each weekend day of training. Thus, it is normal for a SELRES to earn 14 drills for 14 days of ACDUTRA) per year and 48 regular drills for 12 weekends of training per year. In addition, SELRES flight pay is calculated on an average cost per day basis using the same participation rates and number of drills as used for the basic pay and allowances calculations [Ref. 20]. Flight pay calculations are included in Table 8 along with SELRES pay and allowances.

TABLE 8. SELRES AVERAGE DAILY PAY FACTORS (ACDUTRA AND DRILLS) ($ FY-90)

	COST PER DAY ($)	PARTICIPATION RATE	NUMBER OF DRILLS	COST PER YEAR ($)
PAY AND ALLOWANCES				
Officer				
ACDUTRA	155.77	.99	14	2,159
Weekend drills	135.80	.99	48	6,453
.... Total				8,612
Enlisted				
ACDUTRA	63.44	.92	14	817
Weekend drills	53.84	.92	48	2,378
.... Total				3,195
FLIGHT PAY				
Officer				
ACDUTRA	21.00	.99	14	291
Weekend drills	21.00	.99	48	998
.... Total				1,289
Enlisted				
ACDUTRA	5.50	.92	14	71
Weekend drills	5.50	.92	48	243
.... Total				314

Source: CNARF Financial Management Office

5. SELRES Other Pay Factors

There are also other pay and allowance factors which SELRES receive, such as clothing allowances and subsistence pay. This cost can be easily calculated on a per capita basis by dividing FY-90 total expenditures obtained from CNARF by the SELRES end strengths from Table 4. These calculations are shown in Table 9 [Ref. 21].

6. SELRES Accumulation of Costs and Retirement Accrual

Table 10 summarizes the calculations of SELRES pay from Tables 8 and 9, and also adds in the SELRES military retirement accrual which was derived in Table 5.

TABLE 9. SELRES OTHER PAY AND ALLOWANCE FACTORS
($ FY-90)

	OFFICER	ENLISTED
Clothing	581,000	6,428,000
Subsistence	0	7,795,000
. . . . Total	581,000	14,223,000
USNR Strength (from Table 4)	26,919	96,744
Total Per capita ($)	22	147

Source: CNARF Financial Management Office

TABLE 10. SELRES PAY AND ALLOWANCE FACTORS SUMMARY EXCLUDING ADDITIONAL DRILLS
($ FY-90)

	OFFICER	ENLISTED
NON FLIGHT-RATED		
Pay (from Table 8)	8,612	3,195
Other (From Table 9)	22	147
Total pay and allowances	8,634	3,342
FLIGHT-RATED		
Pay and allowances	8,634	3,342
Flight pay (from Table 8)	1,289	314
Total	9,923	3,656
SELECTED RESERVE RETIREMENT ACCRUAL		
NON FLIGHT-RATED		
Pay and Allowances	8,634	3,342
Retirement (from Table 5)	1,154	428
. . . Total with retirement accrual	9,788	3,770
FLIGHT-RATED		
Pay and allowances	9,923	3,656
Retirement (from Table 5)	1,154	428
. . . Total with retirement accrual	11,077	4,084

7. SELRES Additional Drills

Another cost common to Naval Reserve aviation units is "additional drills." Reserve squadron personnel are often required to operate more than 12 weekends and two active duty weeks per year to maintain currency and readiness. In fact, P-3 Officer and Enlisted flight-rated personnel are authorized to perform 48 "additional drills" during each fiscal year. Non-rated Officer and Enlisted personnel are authorized 12 additional drills each fiscal year. The same average cost per day rates for base pay and flight pay as used in Table 8 are used to determine the additional reserve pay cost factors [Ref. 22]. However, the participation rate for additional drills varies greatly and is less predictable than participation rates for ACDUTRA and weekend drills. Based on interviews with CNARF and Reserve Wing Commanders [Ref. 23] [Ref. 24], a "proxy" participation rate of 65% was applied. This was well below the 99% and 89% rates Schank used for additional drills in his analysis of F-4S squadrons. However, he stated in a footnote that he suspected the rate was actually closer to 60% [Ref. 11:p. 115]. Nevertheless, from recent experiences in the field it is firmly believed that 65% is a legitimate rate, and is the rate used in Table 11. In a normal squadron an observer would usually see about one-quarter of the flight-rated personnel use all 48 additional drills, one-half would use about two-thirds of their additional drills, and the remaining quarter would use about one-fifth of their additional drills.

Table 12 is constructed by simply bringing forward the base pay, flight pay, retirement accruals, and additional drill totals from Tables 10 and 11 to arrive at a total SELRES pay and allowances for flight and non-flight-

TABLE 11. SELRES COST FACTORS FOR ADDITIONAL DRILLS
($ FY-90)

	COST PER DAY ($)	PARTICIPATION RATE	ADDED DRILL DAYS	COST PER YEAR ($)
P-3 RESERVISTS				
Flight-rated officer				
Base pay	135.80	.65	48	4,237
Flight pay	21.00	.65	48	655
.... Total				4,892
Flight-rated enlisted				
Base pay	53.89	.65	48	1,680
Flight pay	5.50	.65	48	172
.... Total				1,852
Non-flight officer pay	135.80	.65	12	1,059
Non-flight enlisted pay	53.84	.65	12	420

Source: CNARF Financial Management Office

rated personnel. These totals are then transferred to the Navy Personnel Cost Factor Summary (Table 2).

TABLE 12. SELRES TOTAL PAY AND ALLOWANCE FACTORS
($ FY-90)

TYPE OF PERSONNEL	OFFICERS	ENLISTED
FLIGHT-RATED RESERVIST		
No additional drills (from Table 10)	11,077	4,084
Additional drills (from Table 11)	4,892	1,852
.... Total	15,969	5,936
NON-FLIGHT-RATED RESERVIST		
No additional drills (from Table 10)	9,788	3,770
Additional drills (from Table 11)	1,059	420
.... Total	10,847	4,190

8. TAR Pay and Allowances

The remaining personnel cost factors to determine for Table 2 belong to the TAR (Training and Administration of the Reserve) personnel. TAR personnel are the active duty reservists who train, administer, and coordinate the activities of the SELRES on a full-time basis. In Table 13 a total dollar figure for TAR Officer and Enlisted pay for FY-90 was obtained from NMPC-711, Mr. Don Cunningham [Ref. 25]. These totals contain all the pay categories observed in Table 3 for USN personnel, plus flight pay and retirement accruals. The totals do not include travel, death, gratuities, hospitalization, and bonuses which are later calculated in Table 15. It should be noted that TAR pay factors are slightly higher than their active duty counterparts primarily because of higher average ranks in the TAR Officer and Enlisted rates. This is because most TAR personnel have completed prior active duty military obligations, and therefore enter the TAR program at a more senior rank. The TAR pay and allowance totals are divided by TAR FY-90 end strengths from Table 4 to reach the per capita pay factors shown in Table 13. These per capita pay factors are then transferred to the Navy Personnel Cost Factor Summary (Table 2).

TABLE 13. USNR TAR PAY AND ALLOWANCE FACTORS
($ FY-90)

	OFFICERS	ENLISTED
Pay and allowances	161,928,000	601,180,000
Strength (from Table 4)	2,340	20,332
Cost per capita ($) (to Table 2)	69,200	29,568

Source: NMPC-711

9. Summation of Pay and Allowance Factors

Once per capita pay factors for USN active duty, SELRES, and TAR personnel have been summarized in Tables 7, 12, and 13, and transferred to Table 2, these figures are then multiplied by the number of personnel found in "the average P-3 squadron" (Table 14). These squadron personnel numbers were obtained from various 1000/2 Squadron Manning Documents originating from both the Commander Reserve Patrol Wing Pacific [Ref. 24] and the Chief of Naval Air Reserve Force [Ref. 23].

TABLE 14. P-3 SQUADRON AVERAGE PERSONNEL STRENGTH

	USN	USNR
OFFICERS		
Active (USN)		
Pilots	36	0
Naval Flight Officers	24	0
Non-flight	3	0
SELRES		
Pilots	0	42
Naval Flight Officers	0	28
Non-flight	0	4
Full-time reserve (TARs)		
Pilots	0	4
Naval Flight Officers	0	2
Non-flight	0	1
. . . . Total officers	63	81
ENLISTED		
Active (USN)		
Flight-rated	95	0
Non-flight	179	0
SELRES		
Flight-rated	0	90
Non-flight	0	118
Full-time reserve (TARs)		
Flight-rated	0	30
Non-flight	0	75
. . . . Total enlisted	274	313

Source: CNARF, COMRESPATWINGPAC

An illustration of this calculation uses the USN active duty Officer category as an example. Notice on Table 14 that there are 60 flight-rated Officers and three non-flight-rated Officers in a "typical squadron." These two numbers are then multiplied by the active duty flight and non-flight rate pay factors of $67,284 and $61,672 respectively (Table 2).

Flight-rated Officers	=	60	x	$67,284	=	$4,037,040
Non-flight-rated Officers	=	3	x	$61,672	=	$ 185,016
Total Officers						$4,222,056

A total of $4,222,056 in active duty Officer costs are therefore transferred to the Final Summary Table (Table 1) for accumulation with the other major cost categories. Pay and allowances for USN Enlisted and USNR Officer and Enlisted personnel were calculated the same way as the above example, and likewise transferred to Table 1.

C. OTHER PERSONNEL AND BASE SUPPORT COSTS

"Other personnel costs" consist of permanent change of station (PCS) expenditures for USN personnel, and travel, death gratuities, hospitalization, and bonuses for USNR personnel. The "base support costs" consist of costs for base operations, real property maintenance, and an allocation of Navy medical system costs. Table 15 provides a complete summary of personnel and base operating and support costs, the calculation of which will be discussed in detail.

1. Other Personnel Costs

USN "other personnel costs" can be simply thought of as permanent change of station (PCS) expenditures for FY-90. These expenditures were divided by total FY-90 USN end strength figures obtained from Table 4 to arrive at a per capita cost factor. The PCS expenditures were obtained from

TABLE 15. OTHER PERSONNEL AND BASE OPERATING AND SUPPORT COST SUMMARY
($ FY-90)

COST FACTORS	FLIGHT AND NON-FLIGHT RATED
OFFICER	
USN active (from Tables 16 & 18)	9,639
SELRES (from Tables 17 & 19)	4,218
TAR (from Tables 17 & 19)	5,103
ENLISTED	
USN active (from Tables 16 & 18)	8,156
SELRES (from Tables 17 & 19)	3,281
TAR (from Tables 17 & 19)	3,313

NMPC-711, Mr. Don Cunningham [Ref. 12]. Pertinent calculations are shown in Table 16.

TABLE 16. USN OTHER PERSONNEL COST FACTORS (PCS)
($ FY-90)

	OFFICERS	ENLISTED
Permanent change of station	167,516,000	422,614,000
Strength (from Table 4)	72,090	502,530
Cost per capita ($)	2,324	841

Source: NMPC-711

The USNR "other personnel costs" were broken down into categories of TAR and SELRES personnel, with per capita cost factors figured for each. Again, these costs consisted of travel, death gratuities, hospitalization, and were obtained from CNARF, Mr. Ed Tweedy [Ref. 26]. These costs, much like Table 16, were divided by reserve end strength figures obtained from Table 4. The per capita figures for each category are summed at the bottom of Table 17, and serve as the overall USNR "other personnel" cost factors.

TABLE 17. USNR OTHER PERSONNEL COST FACTORS ($ FY-90)

	SELECTED RESERVE		TAR	
	OFFICER	ENLISTED	OFFICER	ENLISTED
TRAVEL	42,629,000	69,559,000	4,587,000	16,322,000
Strength (from Table 4)	26,919	96,744	2,340	20,332
COST PER CAPITA ($)	1,584	719	1,960	803
DEATH GRATUITIES AND HOSPITALIZATION	413,000	753,000	0	24,000
Strength (from Table 4)	26,919	96,744	N/A	20,332
Cost per capita ($)	15	8	0	1
BONUSES	2,974,000	4,400,000	1,483,000	0
Strength (from Table 4)	26,919	96,744	2,340	N/A
Cost per capita ($)	110	45	634	0
.... Total general cost per capita ($)	1,709	772	2,594	804

Source: CNARF Financial Management Office

2. Base Operating and Support Costs (BOS)

Both the USN and USNR "other personnel" cost factors determined in Tables 16 and 17 were added to the cost factors generated for Base Operation and Support (BOS) before being transferred to Table 15. According to Schank, the BOS costs are an attempt to account for the marginal increase in base operating costs attributed to having that additional unit located on the base [Ref. 11:p. 117]. These costs were arrived at on a per capita basis. Research in the area of Base Operating and Support Costs led to OP-823/NCB-3, the Resource Allocation and Analysis Division of the Office of the

Comptroller of the Navy, Washington, D.C. [Ref. 27]. Through phone interviews with Mr. Chris Heyde, FY-90 base operating data was obtained via facsimile transmission. The information came in the form of obligated transactions for FY-90 of the O&MN and O&MNR accounts for the five budget activities which list obligations for base operations, maintenance of real property,and Naval medical costs. Schank did not assign any medical costs to Reserve BOS, due to the complex methods of accounting in the Naval medical system. However, this study made an attempt to allocate a portion of the total medical costs to the USNR BOS table. This allocation method will be shown later in Table 20.

Table 18 sums up all the base operations categories for the five budget activities which are in the O&MN account. The base operations costs were broken down into many subcategories of specific costs which were too numerous to list in the table. These categories consisted of such things as utilities, engineering support, retail supply operations, base housing operations, communications, security, hazardous waste, MWR, administration, and others. The maintenance of real property account was summed as well, and consisted of MRP, minor construction, and physical security of MRP. The divisor for base operations and maintenance of real property was a combination of both military and civilian end strengths from Table 4. Many civilians work on bases and are considered as equal "base cost drivers" with military personnel. Finally, the allocation of USN medical costs were added to Table 18. The medical costs were divided by military personnel only, due to the limited access civilian employees have to the Naval medical system.

TABLE 18. USN BASE OPERATING AND SUPPORT COST FACTORS ($ FY-90)

Base operations	2,522,687,000
Maintenance of real property	901,672,000
. . . . Total BOS	3,424,359,000
Strength (military & civilian from Table 4)	882,708
Per capita BOS ($)	3,879
USN medical cost allocation (from Table 20)	1,974,224,760
Strength (military only from Table 4)	574,620
Per capita medical ($)	3,436
Total USN per capita BOS and medical costs ($)	7,315

Source: OP-823/NCB-3

In Table 19, the same methodology was used to calculate the USNR Base Operating and Support Cost factors from the O&MNR obligated funds data received from OP-823/NCB-3 [Ref. 27].

TABLE 19. USNR BASE OPERATING AND SUPPORT COST FACTORS ($ FY-90)

Base operations	184,958,000
Maintenance of real property	64,627,000
. . . . Total BOS	249,585,000
Strength (military and civilian from Table 4)	148,744
Per capita BOS ($)	1,678
USNR medical cost allocation (from Table 20)	121,555,240
Strength (military only from Table 4)	146,335
Per capita medical ($)	831
Total USNR per capita BOS and medical costs ($)	2,509

Source: OP-823/NCB-3

3. Medical Cost Allocation to BOS

In calculating the USN and USNR allocated medical costs found in Tables 18 and 19, a new allocation method had to be derived because of the uniqueness of accounting in the Naval medical system. A direct break out of USN and USNR medical costs would have involved contacting all the regional medical hospitals. They are apparently the highest level of authority which maintains the data in that form. In phone conversations with the Bureau of Medicine and Surgery (BUMED) [Ref. 28], it was learned that all Naval Reserve medical clinic charges on reserve bases are charged to the nearest Naval hospital. Thus, all Naval Reserve medical costs wind up in the regular Navy O&MN budget. Therefore, a sound method was devised for allocating USN and USNR medical costs using numbers of USN and USNR personnel as the allocation base. Table 20 serves as a summary of this allocation process. Note that final medical cost allocation figures of $121,555,240 for the Reserves and $1,974,224,760 for the regular Navy were appropriately transferred to Tables 18 and 19.

As a concluding note to Table 20, it should be pointed out that SELRES end strength was calculated as a percentage of the fiscal year an average selected reservist has access to the Naval medical system. This was accomplished by figuring that the average selected reservist drills 14 days of ACDUTRA and 24 days of weekend duty for a total of 38 active duty days per year. This equates to a SELRES being on active duty 10.4% of the year (38/365=10.4%). Multiplying this active duty participation rate by the total number of SELRES personnel in FY-90 (Table 4), yields a SELRES end strength of 12,861 [(26,919 + 96,744) x .104].

TABLE 20. ALLOCATION OF USN AND USNR MEDICAL COSTS (\$ FY-90)

Medical care in regional defense facilities	255,019,000
Care in non-defense facilities	1,312,493,000
Other health activities	140,699,000
Dental care activities	29,080,000
Station hospitals and medical clinics	358,489,000
. . . . Total unallocated medical costs	2,095,780,000
SELRES end strength (from Table 4)*	(26,919 + 96,744) x .104 = 12,861*
TAR end strength (from Table 4)	22,672
. . . . . . Total USNR end strength	35,533
. . . . Total USN end strength	574,620
% USNR of medical costs	35,533/610,153 = .058
% USN of medical costs	574,620/310,153 = .942
USNR medical cost allocation	.058 x 2,095,780,000 = 121,555,240
USN medical cost allocation	.942 x 2,095,780,000 = 1,974,224,760

* *See text for explanation of how SELRES end strength was determined as a percentage of time per year on active duty.*

The final process of completing Table 15 involved the simple addition of the USN cost factors from Tables 16 and 18, and the addition of USNR cost factors from Tables 17 and 19. These aggregated per capita cost factors, when multiplied by the average number of Officer and Enlisted personnel in a squadron (Table 14), resulted in total USN/USNR Other Personnel and BOS Costs for FY-90 that were then transferred to Table 1.

D. REPLACEMENT ACQUISITION AND TRAINING COST

What costs are involved in the replacement of personnel who leave a squadron during the year? This replacement cost of personnel is what this section of the chapter attempts to determine. Replacement costs consist of recruiting and training costs multiplied by a calculated turnover factor for average USN and USNR units. Table 21 is the summary table of Replacement Acquisition and Training Costs for both USN and USNR personnel. This summary table also includes a special category of costs called special active duty training (SPECACDUTRA), which applies to SELRES components exclusively. SPECACDUTRA brings a SELRES service member on additional active duty to accomplish training in a special required school, or to support current operations.

TABLE 21. NAVY REPLACEMENT ACQUISITION AND TRAINING COST SUMMARY
($ FY-90)

	USN	USNR
Replacement Per Capita Acquisition and Training Cost		
Pilot	63,836	0
Naval Flight Officer	32,400	0
Non-flight Officer	9,177	4,588
Enlisted	4,279	454
USNR Special Active Duty Training		
SELRES officer	0	2,861
SELRES enlisted	0	289

**NOTE: These replacement factors represent acquisition and training costs per student, times the turnover rates found in Table 26.*

Notice in Table 21 the reserves do not assume any training costs for pilots and Naval Flight Officers. This is because Naval Reserve aviators are all required to have prior service and training which is most likely obtained while on active duty in the regular Navy. Most nonaviator reservists have regular Navy training as well, and this is why the USN bares the brunt of the majority of acquisition and training costs.

1. Enlisted Acquisition and Training Costs

These costs consist of per capita recruiting, recruit training (boot camp), Navy "A" school training, and the more specialized Naval Aviation Maintenance Training Group (NAMTRAGRU) and Fleet Aviation Specialized Operational Training Group (FASOTRAGRU) training. The first step in the process of assessing enlisted costs consisted of contacting the National Navy Recruiting Command comptroller in Washington, D.C. Their representative, Commander Edison, provided a FY-90 per capita recruiting cost figure of $4,350 [Ref. 29]. She stated, however, that this number may be artificially high due to a lower than average number of assessions in FY-90 (72,000 vice 95,000 in a "normal year"). A "normal year" figure was stated to be approximately $3,100, but for the purposes of this study the actual number of $4,350 was used and entered on Table 22.

Next, to access the average cost of recruit training the Naval Education and Training Program Management Support Activity (NETPMSA) in Pensacola, Florida was contacted. Here, Mrs. Pat Smith, provided the study with a FY-90 average cost per graduate from the three recruit training centers located in San Diego, Great Lakes, and Orlando [Ref. 30]. This cost accounted for an expenditure of $4,939 per recruit. Additionally, NETPMSA provided the FY-90 Enlisted "A" school costs for all the enlisted ratings in a typical P-3 squadron [Ref. 31]. To compute the average "A" school cost per student, a weighted average of each "A" school cost (based on the average number of personnel in each rating in an average P-3 squadron) was used. This cost worked out to be $12,180 per student. Finally, NETPMSA provided the specialized P-3 maintenance training costs originating from NAMTRAGRU, and an "estimated" cost per student for FASO training was obtained from the Officer in Charge of the FASO training detachment at NAS Moffett Field [Ref. 32] [Ref. 33]. These costs combined to show a figure of 2,170 per student.

TABLE 22. ACQUISITION AND TRAINING COSTS FOR NAVY ENLISTED PERSONNEL ($ FY-90)

Recruiting per capita	4,350
Recruit training	4,939
"A" school training	12,180
NAMTRAGRU/FASO training	2,170
. . . . Total per capita	23,639

Source: NETPMSA, Naval Recruiting Command, NAMTRAGRUDET MOFFETT, FASO DET MOFFETT

The per capita cost for P-3 Enlisted acquisition and training totaled $23,639 for FY-90. In translating this cost to Table 1 for USN personnel, this figure of $23,639 was multiplied by 274 enlisted personnel (Table 14), times an 18.1% turnover rate for USN (Table 26), to yield a total cost of $1,172,353 (23,639 x 274 x .181). Thus, $1,172,353 was transferred to Table 1 for USN enlisted replacement acquisition and training. The same method was used to determine the USNR figure of $142,061 (23,639 x 313 x .0192).

2. Officer Acquisition and Training Costs

Table 23 summarizes the assessment of Naval Officer acquisition costs for FY-90. The cost per graduate figures are projections for FY-90 based on the latest FY-89 figures obtained from OP-114 in Washington, D.C. [Ref. 34]. The FY-89 figures were indexed upward by 4% to arrive at the cost per graduate figures shown in the far right hand column. The 4% indexing rate was suggested by the financial management department of CNARF as a figure that was used for government indexing in 1990 [Ref. 26]. Thus, the cost of a typical Naval Academy graduate was determined to be $159,640 (153,500 x 1.04).

TABLE 23. NAVY OFFICER ACQUISITION PROJECTIONS AND COSTS

TRAINING SOURCE	PERCENTAGE OF OFFICERS FROM EACH TRAINING SOURCE			
	PILOT	NAVAL FLIGHT OFFICER	NON-RATED AVIATION OFFICER (A.I./MAINTENANCE)	COST PER GRADUATE ($)
Naval Academy	19%	24%	25%	159,640
ROTC	36%	35%	30%	66,144
Aviation Officer Candidate School (AOCS)	31%	28%	35%	21,239
Other Sources (AVROC, ECP, Interservice, NAVCAD)	14%	13%	10%	20,671

Source: OP-114 and OP-130E2

The calculated percentages from each training source for pilots and Naval Flight Officers was based on the actual number of FY-90 graduates from each source. The graduate figures were obtained from OP-130E2, Commander Jerry Ellison [Ref. 35]. Due to the non-availability of data, the percentages used for non-rated aviation Officers were "proxy percentages" that Schank used in his 1983 study [Ref. 11:p. 121]. These percentages were felt to be reasonably accurate, with any error having only a minimal effect because of the small number of non-rated aviation Officers in each P-3 squadron. Each source of training percentage was then multiplied by the cost per graduate, and then summed as shown below using a typical pilot as an example:

.19 x $159,640 = $30,332 Naval Academy
.36 x $66,144 = $23,812 ROTC
.31 x $21,239 = $6,584 AOCS
.14 x $20,671 = $2,894 Other
$63,622 (cost to acquire one pilot)

The derived costs to acquire each type of Officer were then entered in the acquisition column of Table 24.

TABLE 24. NAVY OFFICER ACQUISITION AND TRAINING COSTS ($ FY-90)

TYPE OF OFFICER	ACQUISITION	TRAINING		TOTAL
		INITIAL FLIGHT TRAINING	FRS TRAINING	
Pilot	63,622	227,302	71,689	362,613
Naval Flight Officer (NFO)	70,101	87,605	27,032	184,738
Non-rated Officer	69,253	30,496	N/A	99,749

3. Officer Initial Flight Training Costs

As evident from Table 24, the training cost portion for Officers is divided into two distinct parts: (1) initial flight training (training costs from commissioning to wings), and (2) fleet replacement squadron (FRS) costs (training costs from wings to fleet squadron placement). Specific FRS costs in the P-3 community are those incurred at VP-30 and VP-31 in NAS Jacksonville, Florida, and NAS Moffett Field, California, respectively.

Initial FY-89 flight training costs were obtained from the Chief of Naval Aviation Training (CNATRA) in Corpus Christi, Texas [Ref. 36]. Once again, due to non-availability of FY-90 data, the latest FY-89 costs were indexed up by 4% (i.e., for a pilot: $218,560 x 1.04 = $227,302). Furthermore, the initial training costs for non-rated Officers (Aviation Maintenance and Aviation Intelligence Officers) of $30,496 was a "proxy figure" based on estimates of maintenance and training costs from P-3 Wing and FRS Maintenance Officers. Once more, it is believed that any error in this category would be small, and the impact would be minimal due to the small numbers of non-rated Officers in a typical P-3 squadron.

4. FRS Flight Training Costs

It is not certain whether Schank's study on F-4S squadrons incorporated FRS training costs. In lieu of this possible deficiency, this study attempts to assign costs to the FRS even though it can become a very difficult task. According to OP-593 in Washington, D.C., all FRS costs are based on pilot costs per flight hour since a majority of a pilot's training syllabus occurs in the cockpit. Similarly, NFO's conduct the vast majority of their training flights in the back of the P-3 concurrently with pilot training flights. Thus, by multiplying the FY-90 aircraft cost per hour for each FRS squadron (VP-30, VP-31) times the number of hours in each pilot syllabus category, times the number of FY-90 FRS student pilots in each category, total flight costs of $12,516,462 and $7,693,350 for VP-30 and VP-31 respectively are calculated [Ref. 37]. A portion of these FRS costs were then allocated for NFO flight training to arrive at a pilot flight training cost of $16,896,412, and a NFO flight training cost of $3,313,400. These figures are divided by the actual number of FY-90 students, to arrive at a per capita figure of $51,829 per pilot and $10,899 per NFO [Ref. 37].

5. FRS Simulator Costs

Simulator training costs for FY-90 were obtained from VP-31, Mr. Niel Collins, NAS Moffett Field, California [Ref. 38]. The cost per hour for simulator use was $53. Multiplying this figure by a FY-90 utilization of

20,713 hours, yielded a total VP-31 cost of $4,980,400. This simulator cost was again allocated among pilots and NFO's based upon an estimated percentage of usage. Estimates of usage among pilots and NFOs were obtained from VP-31 Officers based on experience only. From this source the usage rate was allocated on a basis of 65% pilot and 35% NFO. Thus, by taking the total simulator cost of $4,980,400, and dividing it by the number of FY-90 VP-31 students (based on the above usage rate), a per capita figure of $19,860 per pilot and $11,468 per NFO was obtained. An additional FASO ground school cost of $4,665 per NFO was added to complete the cost estimates [Ref. 33]. The total gambit of FRS costs are captured in Table 25, and final totals are transferred to Table 24 under the heading of FRS training.

TABLE 25. PILOT AND NFO FRS TRAINING COST ESTIMATES
($ FY-90)

	FLIGHT	SIMULATOR	FASO	TOTAL
Pilot	51,829	19,860	0	71,689
NFO	10,899	11,468	4,665	27,032

Source: VP-31, OP-593, FASO DET MOFFETT

The totals for each type of Officer in Table 24 were multiplied by the number of pilots and NFOs per squadron (Table 14), times the respective turnover factors from Table 26. Subsequent total costs were transferred to Table 1. Using pilots as an example: $362,613 (pilot acquisition and training cost) x 36 pilots (Table 14) x .35 (turnover rate, Table 26) = $4,568,924 (pilot replacement cost per squadron).

6. Turnover Factors

This section addresses the development of Table 26 and the turnover factors. Turnover factors measure the replacement rate of all personnel in both active and reserve P-3 squadrons who do not possess prior service experience. The reason replacement costs for USNR pilots and NFOs indicates zero is because of the prior service experience and qualification requirements to fly reserve aircraft. The calculation of each remaining category turnover factor is summarized in Table 26.

TABLE 26. NAVY PERSONNEL TURNOVER FACTORS

PERSONNEL CATEGORY	USN	USNR
ENLISTED		
Losses	91,169	29,946
% without prior service	100%	6.2%
Strength (from Table 4)	502,530	96,744
Turnover rate	.181	.0192
NON-RATED OFFICERS		
Losses	4,898	3,626
% without prior service	100%	29%
Strength (from Table 4)	52,875	22,649
Turnover rate	.092	.046
FLIGHT-RATED OFFICER		
FRS graduates	630	0
Fleet pilots/NFOs	1,800	---
Turnover rate	.35	0

Source: OP-132, CNARF

The USN enlisted losses (91,169) were obtained from OP-132, and the USNR enlisted losses (29,946) were received from CNARF [Ref. 15] [Ref. 17]. These figures were then multiplied by the percentage of replacement of those losses who do not have prior service. Approximately 100% of all USN losses are replaced by personnel who do not have prior service. However, only a very small percentage of USNR enlisted replacements (6.2%) do not have prior service and this dramatically reduces USNR training costs. The enlisted figure of 6.2% was derived by obtaining the FY-90 number of SELRES (6,035) without prior service from CNARF [Ref. 17] and dividing that figure by enlisted SELRES end strength (96,744). As an example, the USNR enlisted turnover rate would be calculated as follows: (29,946 x .062)/96,744 = .0192.

A similar USNR percentage without prior service for non-rated Officers was developed by obtaining the number of FY-90 Officers recruited without prior experience from the Reserve Officer Recruiting Command in New Orleans [Ref. 39], and dividing that figure by non-rated Officer end strength (Table 4).

Finally, the USN flight-rated Officer percentage was developed based on a P-3 community level only, vice a Navy-wide level as was the case with previous parts of Table 26. The FY-90 FRS graduates were comprised of 326 pilots and 304 NFOs, for a total of 630 graduates [Ref. 37]. This number was divided by a total of 1,800 fleet pilots and NFOs from all fleet squadrons, Fleet Replacement Squadrons (FRS) and extraneous P-3 commands. Thus, 630/1,800 = .35 flight-rated Officer turnover rate. As previously mentioned, all reserve pilots and NFOs have prior experience and are listed as zero in Table 26.

7. Special Active Duty

The last factor in this section on Acquisition and Training Costs is a reserve only cost called Special Active Duty For Training (SPECACDUTRA).

SPECACDUTRA is additional active duty a SELRES servicemember receives during the year for such things as career development, schools, refresher or proficiency training, special exercises, service missions, or operational training. Table 27 was developed by obtaining the FY-90 total SPECACDUTRA manday expenditures from CNARF, Commander Mike Filkins [Ref. 10]. According to Commander Filkins, 15,640 mandays of SPECACDUTRA were used in FY-90 by all P-3 reserve squadrons. This total included Officer and Enlisted mandays, where one Officer day equated to 1.9 Enlisted days. The cost per Officer day was $226, and per Enlisted day was $122. Thus, the total FY-90 expenditure for SPECACDUTRA was computed to be $3,534,640 (15,640 x $226). Taking this figure and dividing it by the 13 reserve squadrons provided a per squadron SPECACDUTRA cost of $271,895. Additionally, SPECACDUTRA dollars were allocated among Officer and Enlisted by solving the following system of equations:

(1) $122 (# Enlisted days) + $226 (# Officer days) = $3,534,640
(2) 1.9 (# Enlisted days) = 1 Officer day

Solving the equations provides an approximate allocation of $782,057 for Enlisted and $2,752,680 for Officer SPECACDUTRA in FY-90. Next, these dollar amounts are divided by the P-3 FY-90 SELRES end strength numbers to get the per capita figures shown in Table 27.

As a last step, these per capita figures are then transferred to Table 21 and multiplied by the P-3 reserve squadron personnel strengths (Table 14). The resultant total of $271,826 per squadron was then transferred to Table 1.

TABLE 27. SELRES OTHER TRAINING COST (SPECACDUTRA) FACTOR ($ FY-90)

	ENLISTED	OFFICER
SPECACDUTRA TOTAL DOLLARS	782,057	2,752,680
P-3 SELRES end strength	2,704	962
Cost per capita ($)	289	2,861

Source: CNARF VP Program Manager

E. EQUIPMENT OPERATING COSTS

In capital intensive units such as Naval aviation squadrons, the most expensive costs are those incurred to operate and maintain the equipment. These costs consist of variable costs which are tied to each squadron's operating tempo, plus certain fixed maintenance costs. In the present system, because USNR P-3 squadrons fly approximately 64% of the annual flight hours of USN P-3 squadrons, the USNR squadron's variable costs are less. However, because of the high fixed costs incurred by all P-3 squadrons in maintaining their aircraft, this category has the highest USN to USNR ratio as shown in Table 1 (65.1%).

The Operating and Maintenance Costs considered included petroleum, oil and lubrication (POL), maintenance material, replenishment spares,depot level costs of SDLM, engines and components, aircraft modifications, and ordnance. The availability of data for these costs at times seemed scarce and were ultimately derived from several different sources. Yet, there is great confidence in the totals, and it is felt they fairly represent FY-90 P-3 equipment costs.

Table 28 (P-3 Aircraft Equipment Cost Factors) is displayed on page 49, and a discussion of how the table was developed follows.

TABLE 28. NAVY P-3 AIRCRAFT EQUIPMENT COST FACTORS
($ FY-90)

	USN	USNR
Flying hours/aircraft/year	694	443
Cost/squadron/year for:		
Training ordnance	1,599,208	343,726
Modifications	1,073,493	1,047,006
Depot, SDLM	663,058	561,000
Depot, engine and components	1,603,220	1,586,916
Costs/flying hour for:		
POL	623	369
Maintenance material	187	235
Replenishment spares	237	374

Source: OP-20 Report, COMRESPATWINGPAC, COMPATWINGSPAC, CNARF

Initially, to follow as closely as possible to Schank's methodology, the variable costs for USN P-3 aircraft (such as POL, maintenance material, and spares) had to be broken into costs per flying hour, since these figures originally were provided in total fiscal year dollar numbers only. Dividing these total variable costs by 694 flight hours per USN aircraft (line 1 of Table 28), provided the necessary breakdown of cost per flight hour. This allowed for a convenient comparison of USN cost data to USNR cost data which was submitted at the outset in cost per hour form. It should be kept in mind that for calculating totals a primary authorized aircraft (PAA) level of eight aircraft per squadron was used. Also, when comparing USN and USNR squadrons in this table, keep in mind that the reserves predominantly fly cheaper operating P-3B's and the regular Navy the more costly P-3C's. The USN flying hours were obtained from the Navy OP-20 report (Flying Hour Projection System), which showed 5,552 flying hours per squadron per year, or 694 flying hours per aircraft. The USNR flying hours were obtained from the Commander Reserve Patrol Wing Pacific Maintenance Department which indicated an average squadron flew 3,547 hours in FY-90, or 443 hours per aircraft [Ref. 40]. These numbers were considered fairly representative of all USN and USNR P-3 squadrons in FY-90.

1. Training Ordnance

USN and USNR training ordnance figures for FY-90 were also obtained from the Commander Reserve Patrol Wing Pacific Maintenance Department [Ref. 40]. These figures represented a total of $38,381,001 for all 24 USN squadrons, and $4,468,438 for the 13 reserve squadrons. This breaks down to a total of $1,599,208 and $343,726 being spent on training ordnance by each USN and USNR squadron respectively.

2. Modifications

Aircraft modifications were extremely hard to nail down. These costs consisted of annual airframes changes (AFC), aircraft avionics changes (AVC), and aircraft accessory changes (AAC). Modifications are apparently not tracked by USN and USNR, and had to be allocated. All costs are accumulated into one set of obligations. Thus, it was necessary to allocate total obligations for FY-90 to USN and USNR P-3 forces using numbers of aircraft as the allocation base. From the data received it was impossible to decipher specific P-3B from P-3C modifications. To complicate matters, the data (obtained from the Naval Avionics Depot Maintenance, code 052A, Mr. Bill Baumgartner) was FY-90 budgetary data for planned obligations [Ref. 41]. These FY-90 obligations were "3 year money" totals which, even though obligated in 1990, may not actually be expended until as late as 1992. Therefore, the total figure of $48,611,000 of planned obligations used in this study may err slightly from the actual expenditures made in 1990. Table 29 details the allocation method.

TABLE 29. ALLOCATION BASED ON PERCENTAGE OF AIRCRAFT ($ FY-90)

	# AIRCRAFT	% OF TOTAL	TOTAL ALLOCATION	PER SQUADRON ALLOCATION
USN P-3s	196	53%	25,763,830	1,073,493
USNR P-3s	104	28%	13,611,080	1,047,006
Miscellaneous P-3s	67	19%	9,236,090	N/A
. . . . Total	367	100%	48,611,000	N/A

Source: Navy OP-20 Report, Flying Hour Projection System

The numbers of aircraft were obtained from the previously mentioned Navy OP-20 report (Flying Hour Projection System). The miscellaneous P-3 category consisted of EP-3s, TP-3s, RP-3s, UP-3s, VP-3s, and FRS P-3s. The $48,611,000 budget total obligation for FY-90 was then multiplied by each respective percentage to obtain the allocation amount for each P-3 category. Finally, the USN total was divided by 24 squadrons and the USNR total by 13 squadrons to obtain the per squadron modification costs of $1,073,493 and $1,047,006 respectively. These figures are listed on Tables 1 and 28.

3. Scheduled Depot Level Maintenance

Scheduled depot level maintenance (SDLM) is the scheduled rework of the airframes at certain programmed intervals. For P-3s the intervals are every 46 months, with the duration of rework averaging about 180 days. Other work that is performed at the depot level consists of engine and component rework which will be discussed later. The USN SDLM costs were derived with information obtained from Mr. Ken Klass in the Planning Office of the Naval

Air Rework Facility at NAS Alameda [Ref. 42]. Cost information and allocation calculations are listed in Table 30.

TABLE 30. USN FY-90 SDLM COSTS

TYPE P-3	# FY-90 AIRCRAFT INDUCTED		MANHOURS EXPENDED		RATE PER HOUR		MATERIAL DOLLAR FLAT RATE		TOTAL
P-3A	2	x	13,163	x	51.22	+	400,000	=	1,748,418
P-3B	1	x	12,827	x	51.22	+	200,000	=	856,999
P-3C	19	x	9,770	x	51.22	+	3,800,000	=	13,307,969
. . . . Total									15,913,386

$\frac{15{,}913{,}386}{24 \text{ squadrons}}$ = 663,058 per squadron

Source: NARF Planning Office, NAS Alameda

Mr. Klass provided numbers of aircraft reworked, manhours per aircraft, rates per hour, and a material flat rate of $200,000 per hour. The total as shown in Table 30 was then divided by the number of USN squadrons to yield a per squadron cost of $663,058. This cost was entered in Table 28. Specific FY-90 USNR SDLM costs of $561,000 per reserve squadron were obtained from ADCS Johnson, code 5724, CNARF.

4. POL, Maintenance Material, Replenishment Spares

POL, maintenance material, and replenishment spare costs for USNR P-3 forces were received directly from ADCS Johnson in the cost per hour form shown in Table 28. USN costs for these same categories were more difficult to access. Information concerning these costs were obtained from LCDR Sam Wood, Logistics Officer, Commander Patrol Wings Pacific at NAS Moffett Field [Ref. 43]. His recommended formulation for totaling the cost data was used. The totals he provided were regional in that they applied to the NAS Moffett Field USN squadrons. In the absence of reliable east coast costing data, these west coast averages were extended to represent all USN P-3 squadrons. The calculations are presented in Table 31.

TABLE 31. USN CALCULATION OF POL, MATERIAL, AND SPARE COSTS
($ FY-90)

I.	POL COSTS	AVG # MONTHS		# TRAINING HOURS		COST PER HOUR		TOTAL
	Deployed	4	x	658	x	656.00	=	1,726,592
	Not deployed	8	x	330	x	656.00	=	1,731,840
								3,458,432 per squadron

$\frac{3,458,432}{\text{8 aircraft per sqdr.}}$ = 432,304 per aircraft

$\frac{432,304}{\text{694 hrs. yr}}$ = 623.00 per hour

II. MAINTENANCE MATERIAL COSTS

$\frac{\text{9,100,000 (total expenditures)}}{\text{7 (squadrons on board)}}$ = 1,300,000 x .80 = 1,040,000 per squadron

$\frac{1,040,000}{\text{8 aircraft}}$ = 130,000 per aircraft

$\frac{130,000}{\text{694 hrs. yr}}$ = 187.00 per hour

III. REPLENISHMENT SPARES COSTS:

$\frac{\text{11,500,000 (total expenditures)}}{\text{7 (squadrons on board)}}$ = 1,642,857 x .80 = 1,314,286 per squadron

$\frac{1,314,286}{\text{8 aircraft}}$ = 164,285 per aircraft

$\frac{164,285}{\text{694 hrs. yr}}$ = 237.00 per hour

Source: COMPATWINGSPAC Logistics Office

POL was figured by assuming an average squadron was deployed four months per year. The number of training hours was 330 per month for undeployed squadrons, and 658 per month for deployed squadrons. A cost per hour of $656 was multiplied by the total training hours flown, and then divided by eight aircraft per squadron to arrive at a per aircraft POL cost of $432,304.

Dividing this total yearly aircraft POL cost by the number of flight hours flown per year of 694 (Table 28) resulted in an average POL cost of $623 per hour.

FY-90 total costs were provided by Lcdr Wood for replenishment spares and maintenance material. He recommended these total costs be divided by seven (the number of USN squadrons onboard NAS Moffett Field), and then multiplied by 80% to arrive at an average cost per squadron. These costs were further broken down by dividing by the number of aircraft per squadron, and the number of hours per aircraft, to arrive at a cost per hour as computed in Table 31.

5. Depot Level, Engines and Component Costs

Depot level maintenance costs on engines and components were obtained from the Naval Aviation Depot Operations Center (NADOC), Patuxent River, Maryland, Mrs. Linda Goddard [Ref. 44]. The FY-90 T56 engine costs were broken down by NADOC into USN annual costs of $3,618,939, and USNR annual costs of $2,214,186. The FY-90 P-3 component costs, however, came in one total figure of $65,770,457. Here again, component costs were allocated on the basis of number of aircraft as previously demonstrated in Table 29. The same percentages used in Table 29 were employed in Table 32 to derive the P-3 engine and component cost data.

The bottom line Cumulative Engine and Component Cost figures in Table 32 were transferred to Table 28 where they were combined with depot level costs (SDLM), and ultimately transferred to Table 1.

TABLE 32. FY-90 T56 ENGINE AND P-3 COMPONENT COST

T56 ENGINE PRODUCTION			
UNITS	**CUSTOMER**	**PROGRAM**	**TOTAL COST**
3	USN	Repair	193,468
39	USN	Major repair	4,631,784
			4,825,252
19	USNR	Major repair	2,214,186
ALLOCATION OF T56 ENGINE USN COST			
	# OF AIRCRAFT	**% OF TOTAL**	**TOTAL ALLOCATION**
USN P-3s	196	75%	3,618,939
Miscellaneous P-3s	67	25%	1,206,313
. . . . Total	263	100%	4,825,252
Therefore:	USN T56 engine cost = $3,618,939/24=$150,789 per squadron USNR T56 engine cost = $2,214,186/13 = $170,322 per squadron		
P-3 COMPONENT COST			
	# OF AIRCRAFT	**% OF TOTAL**	**TOTAL ALLOCATION**
USN P-3s	196	53%	34,858,342
USNR P-3s	104	28%	18,415,728
Miscellaneous P-3s	67	19%	12,496,387
. . . . Total	367	100%	65,770,457
Therefore:	USN component cost = 34,858,342/24 squadrons = 1,452,431 per squadron USNR component cost = 18,415,728/13 squadrons = 1,416,594 per squadron		
CUMULATIVE ENGINE AND COMPONENT COST			
USN	150,789 + 1,452,431 = 1,603,220 per squadron		
USNR	170,322 + 1,416,594 = 1,586,916 per squadron		

Source: NADOC Patuxent River, OP-20 Report

F. FINAL COMMENTS

Table 33 (repeat of Table 1) is once again presented for final comments and review on page 56.

Although the data for this research study was gathered in a much more piecemeal manner than John Schank's method (Schank used budget justifications and estimates a great deal), it was discovered that things have not really changed much since his 1985 study of F-4S squadrons [Ref 11:p. 4]. The P-3 Pay and Allowance ratio of 48.6% was very comparable to the 51% formulated in his F-4S case. The Other Personnel and Base Support cost ratio of 48.5% in this study compared favorably to the 39% in Schank's study.

TABLE 33. NAVY P-3 ACTIVE/RESERVE SQUADRON OPERATING AND SUPPORT COST COMPARISON
8 PAA
($ FY-90)

	USN	USNR	RATIO
I. PERSONNEL COSTS			
PAY AND ALLOWANCES:			
SELRES Officer	0	1,161,218	
Active Duty Officer	4,222,056	484,400	
SELRES Enlisted	0	1,028,660	
Active Duty Enlisted	7,742,147	3,140,640	
. . . . Total	11,964,203	5,814,918	48.6%
II. OTHER PERSONNEL AND BASE SUPPORT COSTS:			
Officer	607,257	347,853	
Enlisted	2,234,744	1,030,313	
. . . . Total	2,842,001	1,378,166	48.5%
III. REPLACEMENT ACQUISITION AND TRAINING COSTS:			
Pilot	4,568,924	0	
Naval Flight Officer	1,551,799	0	
Non Flight-Rated Officer	27,531	22,940	
Enlisted	1,172,353	142,061	
Special Active Duty Training	0	271,826	
. . . . Total	7,320,607	436,827	6.0%
IV. EQUIPMENT OPERATING COSTS:			
POL	3,458,432	1,307,736	
Maintenance supplies	1,040,000	832,840	
Replenishment spares	1,314,286	1,325,456	
Depot maintenance	2,266,278	2,147,916	
Modifications	1,073,493	1,047,006	
Ordnance	1,599,208	343,726	
. . . . Total equipment	10,751,697	7,004,680	65.1%
. . . . **Total unit costs**	**32,878,508**	**14,634,591**	**44.5%**

The Replacement Acquisition and Training Costs were 6% in this analysis as compared to 4% in Schank's. This confirms that the reserves benefit greatly from gains in fleet experienced personnel, as well as in tremendously reduced training costs. Finally, as proven in Schank's case and verified by this case, equipment operating costs are by far the most expensive cost factors (69% in Schank's vs. 65%) in VP squadrons because of the high fixed and variable costs in these capital intensive aviation units. The variable equipment costs are merely a reflection of operating tempo differences between USN and USNR forces. Overall, it appears that reserve VP squadrons operate at an attractive 44.5% of the cost of a regular fleet squadron.

Why go to the extent of conducting such a monster of an analysis and data collection in the first place? The reasons - (1) to update the P-3 USN and USNR cost data bases so critical today to DOD analysts and policy makers, and (2) to use this information again in Chapter IV in an attempt to make projections about three crucial alternative force mix changes that are currently being proposed and debated in the P-3 community. It is hoped that this information can be used in a constructive way to project just how much the resultant bottom line cost ratio of 44.5% may change by taking into account other non-recurring costs that may likely exist with force mix changes away from the status quo. What are the non-recurring costs of a force mix change? If the active force is reduced, do the reserves increase operating tempo or will the tempo remain the same? If the active force is reduced, will the reserves have to increase their replacement training costs? Will aircraft modernization result in increased reserve costs? These are the issues that need to be projected and discussed in Chapter IV to give the decision maker more information to work with, to help him or her make an educated guess as to what the real savings are, and to determine if change is really worthwhile.

IV. ANALYSIS OF PROPOSED P-3 ACTIVE/RESERVE FORCE MIX ALTERNATIVES

A. INTRODUCTION

The focus of Chapter IV will be to use the P-3 active/reserve comparative cost analysis model derived in Chapter III (using FY-90 Operating and Support Costs) as a basis for addressing the total cost implications of the larger force mix changes currently being proposed by the Navy and the Department of Defense. As part of the cost analysis performed in Chapter III, certain assumptions were made concerning manning, replacement training, equipment costs, and non-recurring costs. These assumptions will be restated in each of the three proposals intended to downscale the active/reserve mix from the current status of 24 active/13 reserve squadrons. The three force mix alternatives that will be analyzed propose plans to reduce Maritime Patrol force P-3 squadrons to either a level of: (1) 20 active and 13 reserve squadrons (FY-92 mandated reduction); (2) 18 active and 9 reserve squadrons (FY-93 Navy proposal); or (3) 13 active and 13 reserve squadrons (FY-93 DOD proposal). The analysis will encompass a derivation of total annual O&S costs for each of the three alternatives, and a cost comparison of each against the FY-90 cost model. The cost savings generated by each proposal will be discounted over a five year period (FY-92 through FY-96) to yield five year net projected savings to the Department of Defense.

The ensuing cost analysis of the three alternatives represents an initial and necessary quantification of comparable costs of active and reserve P-3 units operating at different force mixes. But the analyses that will be made in this chapter would not suffice alone as a basis for adequately addressing the total cost implications of large force mix changes as those being currently proposed. There are additional non-recurring costs associated with instituting large changes that must be included to provide a complete and suitable cost analysis. These costs go beyond the scope of this thesis, but will be identified and discussed in the next section.

B. NON-RECURRING COSTS

Non-recurring costs are basically the one-time capital outlays that result from structure changes that inevitably occur during the activating or deactivating of units when making force mix changes. These costs can be significant, and should not be overlooked in any total cost analysis. If these costs are not anticipated, policy makers could be easily deceived by the savings or cost projections derived from cost analysis models such as the one formulated in Chapter III. Information concerning non-recurring costs was obtained from another study done by John Schank for the RAND Corporation entitled *Cost Analysis of Reserve Force Change - Non-Recurring Cost and Secondary Cost Effects* [Ref. 45]. In his study concerning non-recurring costs Schank states:

> These analyses, and many similar exercises performed by other organizations, have estimated the annual operating and support costs of individual units, treating only lightly, if at all, the net costs resulting

> from making specific changes to the existing force structure. Although the annual cost comparisons of Active and Reserve Force units are certainly important, the dynamic costs of a changing force must also be considered. [Ref. 45:p. 1]

Another key point addressed by Schank is the extreme difficulty of identifying and quantifying some of the applicable non-recurring costs [Ref. 45:p. 3]. Schank's study explores several force mix scenarios - most of which dealt with the activation of units (probably because his studies were conducted in an expanding force period). He does, however, indicate in a few cases the implications of deactivating units, which are the primary concern of current P-3 force mix proposals. The scenario of simultaneously deactivating reserve and active units was not specifically addressed. However, the following discussion draws inferences from his case studies involving force mix changes, and attempts to apply them to a declining force mix scenario. The primary non-recurring cost elements that Schank identifies are:

1. Construction of unit facilities
2. Procurement of unit equipment (aircraft, test and support equipment, munitions, spares)
3. Personnel acquisition
4. Personnel training
5. Other [Ref. 45:p. 14]

The "other" category is Schank's "catch all" where this study inserts a list of secondary costs (force-wide costs) which Schank identifies as:

1. Equipment transfers

2. The "Ripple Effect"

3. Mission transfer

4. Personnel pipelines

All of these secondary costs apply to the deactivation of P-3 units, but to better suit the current declining P-3 squadron scenario, a relabeling of Schank's primary non-recurring cost elements was undertaken. The "deactivation version" of primary non-recurring costs can be found listed in Table 34.

TABLE 34. PRIMARY P-3 NON-RECURRING COST ELEMENTS IN A DECLINING FORCE MIX ATMOSPHERE

1. Reprogramming use or destruction of vacant facilities
2. Divestment costs of excess unit equipment
3. Divestment costs of excess personnel
4. Divestment costs of personnel training
5. Other (secondary) costs:
    A. Equipment transfers
    B. The "Ripple Effect"
    C. Mission transfer
    D. Environment Costs
    E. Personnel pipelines

Further inferences made based on the Schank cases explored, postulates that non-recurring costs are generally less expensive in deactivating units than in activating units. This is an unproven "gut feeling" and to prove this would be a topic for follow-on study. Nonetheless, the assumption is made that in a declining squadron environment, such as that facing the P-3 community, non-recurring costs may be much less than costs associated with standing up squadrons. It is therefore imperative that the force mix decision makers consider the potential high costs of reactivating P-3 squadrons should the perceived reduced Soviet threat re-emerge.

1. Reprogramming Use or Destruction of Vacant Facilities

Reprogramming the use or destruction of excess capacity in such facilities as "hangars, flight lines, maintenance buildings, administration buildings, and personnel support facilities such as dining halls, commissaries, and barracks" [Ref. 45:p. 14] are all costs of deactivating units. Once these one time costs are incurred, however, there will be recurring cost savings to support bases in the areas of operating support and maintenance of real property.

2. Divestment of Unit Equipment

Divesting unit equipment costs would include transfer or disposal costs of such items as: ground support equipment, maintenance support and test equipment, spares, and munitions. This would include storage areas where this gear is maintained. [Ref. 45:p. 17]

3. Divestment Costs of Personnel

Divesting excess personnel could entail a reduction in force (RIF), a reprogramming of personnel into other parts of the Navy, or a combination thereof. RIF costs could be substantial, and would include such costs as severance pay, PCS moves, medical benefits, and the "sunk costs" of previous training for which there is minimal "pay back." Reprogramming personnel into other areas of the Navy may include transfer costs, PCS moves, and learning curve or delay in new position costs.

4. Divestment Costs of Personnel Training

Personnel costs incurred during deactivation include costs such as transition training (if reserve personnel upgrade their equipment), retraining of personnel who are reprogrammed into new positions, and costs created by underutilization and excess capacity in training facilities.

5. Other - Secondary Force Wide Costs

Equipment transfer costs are included in this study since P-3 reserve squadrons are programmed to modernize from P-3B to P-3C aircraft as a result of deactivation of active squadrons. These transfer costs include the modernization of support facilities at remote reserve bases which are currently equipped to support only the P-3B. These types of costs are minimized at the major P-3 sites such as NAS Jacksonville, Brunswick, and Moffett Field. Additionally, there would be consideration for the costs of mothballing, modifying or discarding the replaced reserve P-3Bs.

In addition to equipment transfers, Schank discussed the concept of "Ripple Effect." "Ripple Effect" is basically the impact activating or deactivating units has on other units throughout the military structure [Ref. 45:p. 8]. Examples of this would include reserve aircraft modernization requiring upgraded support facilities, and less demand for P-3 personnel creating excess capacity in training commands. In a deactivation situation it can be excess capacity created in hierarchial administrative units, as well as increased demand on the few remaining squadrons if the mission does not decrease proportionally with the decrease in squadrons.

Another possible secondary cost is mission transfer. The question of mission transfer specific to the declining P-3 force mix remains unresolved and could re-emerge if the threat or world situation changes. An interesting finding in this research study is that the Department of Defense apparently has no plans to transfer missions to reserve squadrons or the remaining active squadrons should any of the three proposals become reality. Two questions concerning mission transfer are therefore raised: (1) "If active duty squadrons are deactivated and the reserve squadrons are modernized with P-3C aircraft, will the reserves pick up more of the mission and increase operating tempo?"; or (2) "Is the P-3 deactivation based entirely on a reduced perceived Soviet threat, thereby keeping the remaining active and reserve squadrons operating at current tempos?" Recent congressional records suggest reserve squadrons will be modernized, and that the numbers of TAR personnel in squadrons will be increased so that mission transfer can be enacted. However, the proof is in the pudding when looking at the outyear budgets. There have been no increases in TAR personnel, or increased funds for additional flight hours [Ref. 46]. This suggests that all force mix decisions are being made on a cost savings and perceived reduced threat basis, vice mission transfer to other units.

The environmental costs of deactivating military units and bases is currently in the news as Congress assesses the costs of a long list of base closures. The non-recurring costs of toxic clean up at military bases is proving to be massive. These costs were totally unexpected and non-quantifiable. In a recent article in *The Monterey Herald* concerning the closure of the Army's Fort Ord, Congressman Leon Panetta stated "the Army is projecting a $400 million quickie return on the land at Fort Ord, but that's unrealistic because cleaning up toxic contamination at the base could cost the Army that much."

The final secondary cost is the personnel pipeline issue. As indicated in Chapter III the reserves draw most of their personnel from active duty squadrons who pick up the tab for initial training. If the number of active duty squadrons are reduced disproportionately in relation to reserve squadrons, this could dry up a portion of that "personnel pipeline" flowing to the reserves. Thus, reserve squadrons would either have to train their own, retain personnel for longer periods, or increase the number of TAR personnel in order to maintain the current operating tempo. All of these options serve to dramatically increase reserve training costs.

Non-recurring costs are very subtle, involved and hard to quantify. This discussion merely scratches the surface of their impact. This study does not attempt to identify or quantify all the non-recurring costs associated with P-3 force mix changes, but it is vital to discuss and be aware of their existence. In summary, non-recurring costs were generally excluded from this study for the following three main reasons:

1. The probability that deactivation is less expensive than activation under the current structure in the P-3 community.

2. The force mix change is occurring incrementally and with advance notice (which creates better planning and anticipation).

3. Finally, as Schank states: "Annual recurring unit costs are typically larger, especially for aviation and ship units, than the non-recurring costs identified in the case studies. If the Reserve Component unit change results in a decrease in annual recurring budgets, the non-recurring investment may be recovered in a few years." [Ref. 45:p. viii]

C. FORCE MIX ALTERNATIVE I (20 ACTIVE/13 RESERVE SQUADRONS

Before FY-91 the historical P-3 active/reserve force mix was 24 active and 13 reserve squadrons. That was the force mix which was costed in Chapter III resulting in a reserve/active cost ratio of 44.5%.

The first alternative force mix of 20 active/13 reserve squadrons was chosen for analysis for the simple reason that this is the mix the fleet is scaling down to in FY-92. In fact, four active P-3 squadrons are currently being deactivated and the force will be at 20/13 by the end of FY-91. Thus, it seems only logical to first analyze the total cost implications and savings that this first major force mix change realizes.

1. Assumptions

Since the Chapter III cost analysis was based on the historical 24/13 force mix, some important questions arise concerning the 20/13 mix scenario. For example, "Do cost relationships change when the P-3 force mix changes from that of the status quo?" "Will operating and personnel costs rise in reserve squadrons as active squadrons are reduced?"

The answer to the first question is Yes and No. In reality, force mix changes of any size would incur certain non-recurring costs (such as mission transfer or ripple effect as previously stated) which would cause cost relationships among remaining active and reserve forces to change. Additionally, it could be argued that if fewer aircraft will be remaining in the inventory, then the requirement for aircraft components and spare parts will diminish and unit costs will rise. For purposes of this analysis, however, cost relationships will not change since identification and consideration of non-recurring costs go beyond the technical scope of this thesis. Furthermore, although it is likely unit costs of components and parts would rise to some degree, optimum production rates of these items are unknown and thus it would be impossible to figure cost differences. In any event, according to Schank, a small force mix change in a declining environment will not change the cost relationships dramatically [Ref. 45:p. vi].

In regards to question two, Captain Doug Birr, OP-05R, stated that there have been no indicators to suggest increases in TAR personnel, or increased flight hours accompanying this reduction proposal [Ref. 46]. Therefore, historical operating tempos and personnel manning levels from Chapter III are used in the analysis of Alternative I. With the modernization of reserve squadrons to P-3C aircraft as the four active squadrons are deactivated, it is a certainty that reserve equipment operating costs will rise. This factor has been incorporated into the analysis.

As a final note, it can be assumed that the remaining 20 active P-3 squadrons will be able to continue to supply sufficient replacement personnel to the 13 reserve squadrons. Therefore, replacement training costs are held at historical levels.

2. Analysis Procedure

First, a new summary table for Alternative I, incorporating known cost changes was developed and displayed in Table 35. Next, a comparison of the final cost data of Alternative I was made in relation to the status quo cost data derived earlier in Chapter III. Projected annual cost savings were computed. Finally, the annual cost savings projection was discounted over the period FY-92 through FY-96 to arrive at a five year present value of future cost savings figure.

TABLE 35. ALTERNATIVE I FORCE MIX: SUMMARY OF ESTIMATED OPERATING AND SUPPORT COSTS.
($ FY-90)

		USN	USNR	RATIO
I.	Personnel Costs:			
	Pay and Allowances:			
	SELRES Officer	0	1,161,218	
	Active Duty Officer	4,222,056	484,400	
	SELRES Enlisted	0	1,028,660	
	Active Duty Enlisted	7,742,147	3,140,640	
	.... Total	11,967,203	5,814,918	48.6%
II.	Other Personnel and Base Support Costs:			
	Officer	607,257	347,853	
	Enlisted	2,234,744	1,030,313	
	.... Total	2,842,001	1,378,166	48.5%
III.	Replacement Acquisition and Training Costs:			
	Pilot	4,568,924	0	
	Naval Flight Officer	1,551,799	0	
	Non-flight Officer	27,531	22,940	
	Enlisted	1,172,353	142,061	
	Special Active Duty Training	0	271,826	
	.... Total	7,320,607	436,827	6.0%
IV.	Equipment Operating Costs:			
	POL	3,458,432	2,207,912	
	Maintenance Supplies	1,040,000	662,728	
	Replenishment Spares	1,314,286	839,928	
	Depot Maintenance	2,266,278	2,147,916	
	Modifications	1,073,493	1,073,493	
	Ordnance	1,599,208	343,726	
	.... Total Equipment	10,751,697	7,275,703	67.7%
	.... **Total Unit Costs**	**32,878,508**	**14,905,614**	**45.3**

In Table 35, Equipment Operating Costs per squadron are the only costs that changed based upon the P-3C aircraft modernization of reserve squadrons. This was accomplished by applying all USN P-3C costs from Table

28 to the USNR column (except for reserve flying hours per aircraft and training ordnance). Appropriate changes to Table 28 are shown in Table 36.

TABLE 36. AIRCRAFT EQUIPMENT COST FACTORS FOR ALTERNATIVE I.
($ FY-90)

	USN	USNR
Flying hours/aircraft/year	694	443
Cost/squadron/year for:		
Training Ordnance	1,599,208	343,726
Modifications	1,073,493	1,073,493
Depot, SDLM	663,058	663,058
Depot, Engines and Components	1,603,220	1,603,220
Costs/flying hour for:		
POL	623	623
Maintenance Material	187	187
Replenishment Spares	237	237

A final examination of Table 35 (excluding the non-recurring costs of deactivation) shows a slightly higher reserve/active cost ratio of 45.3% when compared to the status quo cost ratio of 44.5%. The major cost savings is being realized from the operation of four less active duty squadrons. Alternative I annual cost savings are calculated in Table 37.

TABLE 37. ALTERNATIVE I PROJECTED ANNUAL COST SAVINGS
($ FY-90)

Status Quo: 24/13 mix	# Squadrons		Annual Cost Per Squadron		Total Cost
USN	24	x	32,878,508	=	789,084,192
USNR	13	x	14,634,591	=	190,249,683
..... Total USN + USNR					979,333,875
Alternative I: 20/13 mix					
USN	20	x	32,878,508	=	657,570,160
USNR	13	x	14,905,614	=	193,772,982
..... Total USN + USNR					851,343,142
Therefore: annual cost savings (979,332,875 - 851,343,142)				=	$127,990,733

NOTE: Annual costs per squadron were obtained from Table 1 for the 24/13 mix, and Table 35 for the 20/13 mix.

As shown, an alternative force mix of 20/13 would save approximately $128 million per year in FY-90 dollars. Projecting these cost savings for the period FY-92 through FY-96 (using a discounting factor of 4%) resulted in a five year present value of future cost savings of $547,876,926 (Table 38).

TABLE 38. COST SAVINGS OF ALTERNATIVE I DISCOUNTED AT 4% (FY-92 TO FY-96) ($ FY-90)

	FY-92	FY-93	FY-94	FY-95	FY-96
Discounted Savings (4%)	118,334,627	113,783,296	109,407,015	105,199,053	101,152,935
		Total 5 Year Savings	$547,876,926		

Table 38 shows a five year discounted cost savings projection in excess of one half billion dollars. This substantial cost savings would rapidly recover any non-recurring costs generated by the four squadron reduction, assuming operational tempos, manning, and maintenance units costs would remain the same [Ref. 45:p. viii].

D. FORCE MIX ALTERNATIVE II (18 ACTIVE/9 RESERVE SQUADRONS)

In the analysis of the FY-93 Department of the Navy force mix proposal of 18 active and 9 reserve squadrons, Captain Doug Birr, OP-05R, was again consulted concerning the status of flight hour or manning level increases which may accompany a deactivation of this level. His response remained consistent in that the Navy anticipated no flight hour increases or additional TAR billets programmed into these reductions. Therefore, the same assumptions that were made for Alternative I were applied to Alternative II (incorporating only increased costs for reserve modernization to the P-3C aircraft). The same slightly higher cost ratio of 45.3% found in Table 35 of Alternative I was again used to find a new cost savings projection between the status quo mix of 24/13 and the Alternative II mix of 18/9 in Table 39.

TABLE 39. ALTERNATIVE II: PROJECTED ANNUAL COSTS SAVINGS
($ FY-90)

Status Quo: 24/13 mix	# Squadrons		Annual Cost Per Squadron		Total Cost
Total USN + USNR (Annual cost previously found in Table 37)					979,333,875
Alternative II: 18/9 mix					
USN	18	x	32,878,508	=	591,813,144
USNR	9	x	14,905,614	=	134,150,526
. . . . Total USN and USNR Costs					725,963,670
Therefore: Annual Cost Savings (979,333,875 - 725,963,670)				=	$253,370,205

Note: Annual costs per squadrons from Table 35.

Table 39 yields an annual cost savings projection of approximately $253 million per year in FY-90 dollars. Projecting these cost savings for the period FY-92 through FY-96 (using a discounting factor of 4%) resulted in a five year present value of future cost savings of $968,655,723 (Table 40) for Alternative II. Alternative I savings were used for FY-92 since Alternative II savings will not be realized until FY-93.

TABLE 40. COST SAVINGS OF ALTERNATIVE II DISCOUNTED AT 4% (FY-92 TO FY-96)
($ FY-90)

	FY-92	FY-93	FY-94	FY-95	FY-96
Discounted Savings (4%)	118,334,627*	225,245,190	216,581,913	208,251,870	200,242,153
	Total 5 Year Savings $968,655,723				

** Alternative I cost savings used for FY-92 since Alternative II savings do not apply until FY-93.*

Table 40 shows that the stair stepped decline to a force mix of 18 active and 9 reserve squadrons is estimated to save nearly $1 billion in O&S costs during the five year period FY-92 through FY-96 (FY-90 dollars).

E. FORCE MIX ALTERNATIVE III (13 ACTIVE/13 RESERVE SQUADRONS)

The third and final analysis of proposed force mix alternatives was initiated by the Department of Defense for FY-93. DOD has proposed an active P-3 force reduction of 11 squadrons for a mix of 13 active and 13 reserve squadrons. This dramatic decrease in active P-3 squadrons would have a significant impact on the "personnel pipeline," which as previously stated, is the current primary source of manning for reserve squadrons. If this proposal were enacted, the reserves would more than likely need to initiate policy or structural changes in order to maintain current operating tempos. The following options have been suggested as possible reserve solutions to counter a reduced pipeline:

1. Increase TAR manning [Ref. 47]
2. Reserves train their own program
3. Increased SELRES contractual obligations
4. Increase SELRES overgrade waivers

Option 1, to increase TAR manning levels, was utilized in this analysis because it was the option proposed by OP-05R [Ref. 47]. It also required the least in the way of reserve policy changes. OP-05R generated estimates of TAR manning increases in an effort to anticipate the reserve manning deficiencies resulting from the disproportionate reduction in active P-3 squadrons should

Alternative III be enacted. Option 2 (reserves train their own) would be possible, but this method would attempt to develop reserve Officers who have never had "fleet experience." Options 3 and 4 would require changing fundamental reserve policies and reenlistment contracts which would affect all reserves, and not just P-3 squadron personnel. A new summary table (Table 42) has been generated to incorporate reserve TAR manning increases and P-3C modernization.

According to the OP-05R estimates, a force mix of 13 active and 13 reserve squadrons would require an approximate 44% TAR manning level as opposed to a historical 31% TAR manning level [Ref. 47]. The OP-05R TAR manning estimates for a 13 active and 13 reserve squadron mix can be found in Table 41.

TABLE 41. OP-05R TAR MANNING ESTIMATES

		TAR	SELRES	TOTAL	%
I.	Historical 24 Active/13 Reserve Force Mix				
	Officer	7	68	75	31%
	Enlisted	105	186	291	TAR manning
II.	13 Active/13 Reserve Force Mix				
	Officer	21	54	75	44%
	Enlisted	141	150	291	TAR manning

Source: OP-05R
NOTE: These are merely estimates by OP-5R and are not official or incorporated into any future planning

The USNR per capita pay figures generated in Chapter III, Table 2, are multiplied by the increased TAR manning levels in Table 41 to arrive at the new USNR personnel costs in Table 42.

In a force mix change as large as Alternative III, the non-recurring costs become more widespread, harder to identify, and harder to quantify [Ref. 45:p. vi]. For example, the unit costs for SDLM aircraft and components may rise;

TABLE 42. ALTERNATIVE III FORCE MIX: SUMMARY OF ESTIMATED OPERATING AND SUPPORT COSTS
($ FY-90)

		USN	USNR	RATIO
I.	PERSONNEL COSTS:			
	PAY AND ALLOWANCES			
	SELRES Officer	0	847,368	
	Active Duty Officer	4,222,056	1,453,200	
	SELRES Enlisted	0	741,750	
	Active Duty Enlisted	7,742,147	4,217,451	
	.... Total	11,964,203	7,259,769	60.1%
II.	OTHER PERSONNEL AND BASE SUPPORT COSTS:			
	Officer	607,257	347,853	
	Enlisted	2,234,744	1,030,313	
	.... Total	2,842,001	1,378,166	48.5%
III.	REPLACEMENT ACQUISITION AND TRAINING COSTS:			
	Pilot	4,568,924	0	
	Naval Flight Officer	1,551,799	0	
	Non Flight-Rated Officer	27,531	22,940	
	Enlisted	1,172,353	142,061	
	Special Active Duty Training	0	271,826	
	.... Total	7,320,607	436,827	6.0%
IV.	EQUIPMENT OPERATING COSTS:			
	POL	3,458,432	2,207,912	
	Maintenance supplies	1,040,000	662,728	
	Replenishment spares	1,314,286	839,928	
	Depot maintenance	2,266,278	2,147,916	
	Modifications	1,073,493	1,073,493	
	Ordnance	1,599,208	343,726	
	.... Total equipment	10,751,697	7,275,703	67.7%
	.... **Total unit costs**	**32,878,508**	**16,350,465**	**49.7%**

the cost to train a pilot may rise dramatically; and the marginal cost of per capita base operating and support cost may rise with a reduction of 11 active squadrons. Again, these changes are hard to predict and were not incorporated into this analysis. Therefore, the alternative with the most likely error in total costs would be Alternative III. The 49.7% reserve/active cost ratio (Table 42) could easily exceed 50 or 60% with non-recurring deactivation costs included.

In any case, the projected annual cost savings of Alternative III were developed in Table 43.

TABLE 43. ALTERNATIVE III: PROJECTED ANNUAL COST SAVINGS
($ FY-90)

Status Quo: 24/13 Mix	# Squadrons		Annual Cost Per Squadron		Total Cost
Total USN + USNR (annual cost previously found in Table 37)					979,333,875
Alternative III: 13/13 Mix					
USN	13	x	32,878,506	=	427,420,578
USNR	13	x	16,350,465	=	212,556,045
Total USN + USNR Costs					639,976,623
Therefore: Annual Cost Savings (979,333,875 - 639,976,623)				=	$339,357,252

NOTE: Annual costs per squadron figures obtained from Table 42.

An estimated $340 million per year would be saved (FY-90 dollars) if Alternative III were enacted. Once again, this savings estimate was discounted and summed over the same five year period (FY-92 through FY-96) in Table 44.

TABLE 44. COST SAVINGS OF ALTERNATIVE III DISCOUNTED AT 4% (FY-92 TO FY-96)
($ FY-90)

	FY-92	FY-93	FY-94	FY-95	FY-96
Discounted Savings (4%)	118,334,627*	301,687,361	290,084,001	278,926,924	268,198,966
Total 5 Year Savings $1,257,231,879					

** Alternative I cost savings used for FY-92 since Alternative III savings do not apply until FY-93.*

Alternative III projects a five year discounted savings of nearly $1.25 billion if the Department of Defense elects to downscale to a mix of 13 active and 13 reserve squadrons.

Finally, Table 45 displays a summary of the five year discounted cost savings projection of all three alternative force mix proposals. The savings that the Department of Defense can obtain by implementing any of the three force mix alternatives ranges from a low of $.5 billion to a high of $1.25 billion. These numbers are realistic and could represent the first installment savings on a five year plan that the Department of Defense feels is consistent with the reduced threat to national security. Decision makers need to be reminded, however, that some of the cost savings from squadron deactivation could be expended by earlier defined one-time non-recurring closure costs, and those costs that might be incurred in meeting additional training requirements of remaining squadrons whose missions could ultimately be realigned or consolidated to assure overall VP readiness capability is maintained. [Ref. 48:p. 38]. In any event, these cost savings projections and cost ratios are the impetus for the summary statements, conclusions and recommendations to follow in Chapter V.

TABLE 45. ALTERNATIVE I, II, AND III COST SAVINGS PROJECTION SUMMARY
($ FY-90)

	5 Year Cost Savings	Cost Ratio Reserve/Active
Alternative I - 20 Active/13 Reserve	$547,876,926	45.3
Alternative II - 18 Active/13 Reserve	$968,655,723	45.3
Alternative III - 13 Active/13 Reserve	$1,257,231,879	49.7

Note: Five year projections discounted at 4%

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

Probably the most widely discussed total force issue of the past year has been the active/reserve force mix decision process - the methodology used and factors considered in assigning forces and missions to the active and reserve components. Triggered by a rising defense budget and the changing circumstances in the world (the threat change), the active/reserve Maritime Patrol (VP) force mix issue, in particular, has been a subject of much debate during recent Congressional hearings.

In light of the growing public concern over increased defense spending and Congressional directives stressing the need to reduce costs through more efficient use of available reserve forces, Chapter I stated that the focus of this thesis was to identify and analyze the cost differences between an active duty VP squadron and a similar reserve squadron. The idea of performing a cost analysis comparing annual operating and support costs of active and reserve VP squadrons with similar manning, equipment and wartime missions was timely and appropriate in view of recent mandates to downscale the VP community.

Chapter II provided a brief introduction to the Reserve force structure with emphasis on defining the key personnel terms and Reserve participation requirements. The concept of Reserve force integration was introduced, and the prospect that continued integration and modernization of the VP Reserves could yield significant peacetime dividends for the Navy was discussed.

Chapter III laid the groundwork for the costing approach. Cost definitions, details and assumptions of the analysis were reviewed and a framework for assessing the personnel, equipment and support costs of each organization was developed.

The latest FY-90 VP cost data obtained from official published service documents and professional organizations visited during research trips was then applied to the generated cost model. The results of the costing methodology, and general observations of the factors that drive the annual costs of VP active and reserve force units and resulting cost differentials were discussed.

Finally, Chapter IV investigated the cost savings related to recently proposed active/reserve force mix alternatives, and the associated non-recurring costs of instituting a large force mix change were explained.

B. CONCLUSIONS

Although active and reserve P-3 squadrons have nearly the same types and amounts of equipment and personnel, the results of this study indicate that substantial cost savings are present within the reserve P-3 side. The final cost comparison clearly shows that the P-3 Reserve squadron had annual operating and support costs of 44.5 percent of the cost of the active squadron with an annual total cost savings of approximately $18.25 million for FY-90 (Table 33).

General observations of the study show that the P-3 Reserve forces typically realize cost advantages over the active forces in the areas of personnel costs, replacement training costs, base operating support costs, and reduced equipment operating requirements in a peacetime environment. Figure 1 shows the comparable costs of an active P-3 squadron and a reserve P-3 squadron. The costs are broken into the four main categories as described in Chapter III. The ratio of reserve P-3 costs to active P-3 costs for each category and for the total annual unit cost is indicated by the values between the active and reserve bars.

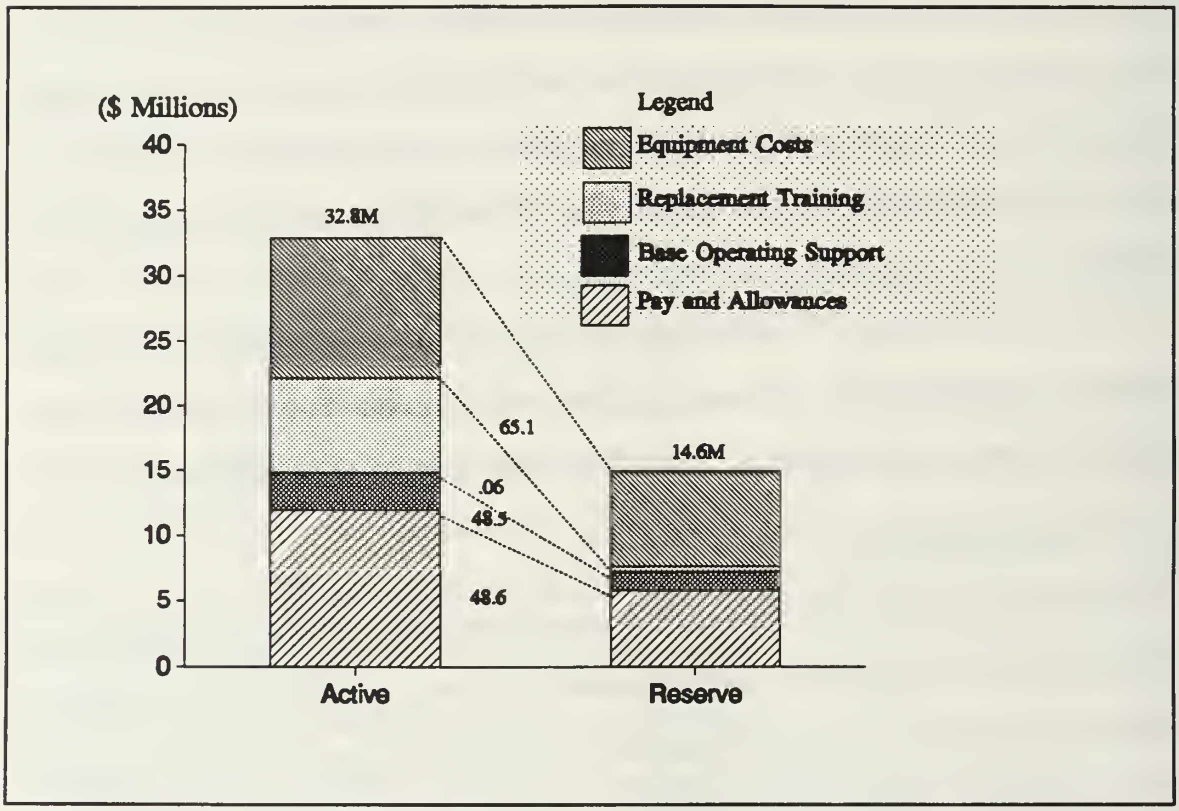

Figure 1. Cost Comparison of P-3 Active and Reserve Squadrons ($ Millions FY-90)

The larger-than-expected reserve personnel cost ratio of 48.6 percent contradicts the conventional notion that a reserve unit's personnel should cost approximately 20 percent of a comparable active unit's personnel [Ref. 6:p. vii]. The higher reserve personnel costs can be explained by the large number of full-time members (TARs) who must perform the continuous equipment maintenance and unit support functions that are required to operate the squadrons. Also, the reduced availability of full-time reserve crews to operate aircraft in peacetime limits the operating tempo of reserve squadrons and reduces those variable costs related to flying hours.

The replacement training costs for the reserve P-3 squadron are a microscopic six percent of the cost for the active squadron because of the combination of higher retention rates and prior-service gains of the reserves. In Naval aviation, the high costs of training aircrew members has made the recruiting of prior-service individuals a very cost effective reserve strategy.

Figure 2 compares the five year projected cost savings as a result of transferring modern P-3C's to reserve squadrons and deactivating active squadrons based on current and proposed P-3 force mixes. The range of savings from $.5 billion to $1.25 billion over five years (discounted for inflation) is slightly less optimistic than Senator Sam Nunn's earlier savings estimates of between $1.5 and $1.8 billion.

C. RECOMMENDATIONS

1. For Navy Policy

a. Developing the tools and models that would aid analysis in providing the cost details needed in making VP force mix policy decisions (as this thesis has done) is important. However, cost should not be considered the driving factor in determining the assignment of missions between the active and reserve VP forces - supporting national security objectives should be. Responsible officials from the Assistant Secretary of Defense for Force Management to the Chairman of the Joint Chiefs of Staff need to consider

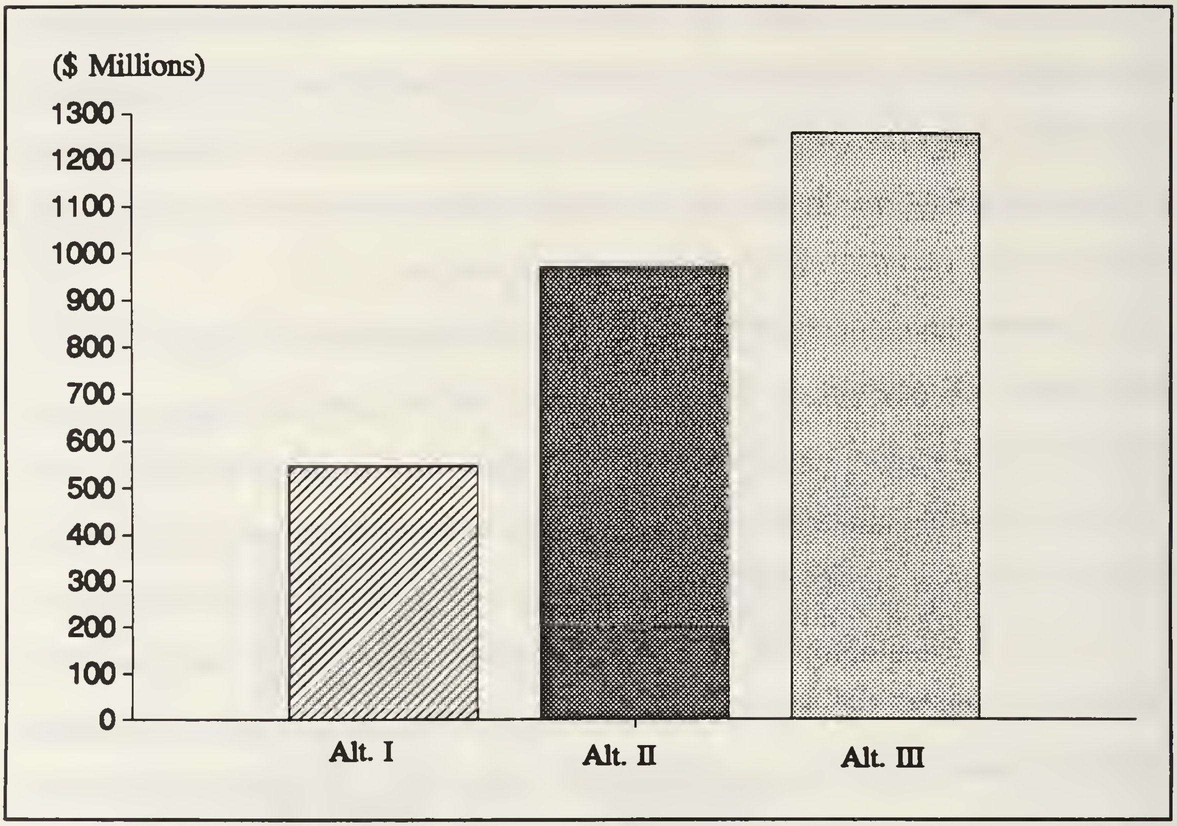

Figure 2. Projected Cost Savings for Each of the Proposed VP Force Mix Alternatives

mission accomplishment and not budget constraints as the deciding factor in determining the number of VP squadrons to be downsized or eliminated from the force structure.

b. The 46 percent reduction in the size of the active VP forces as proposed by the Department of Defense would seriously preclude full P-3 coverage of forward deployed sites. New generations of substantially quieter and more capable submarines in the Soviet Union and navies of other countries requires sufficient numbers of P-3s to counter the threat. Despite the "perceived" reduced threat, a need exists to preserve VP skills and equipment, so that we do not reach a point where the changes we make are irreversible. "Historically, this country has disarmed after every war, and it is entirely possible that we will repeat the mistakes of the past and disarm after the Cold War so thoroughly that we will create the foundation for the instability that may lead to the next war [Ref. 49]." As an alternative, DOD needs to explore innovative new strategies to reduce costs, such as a policy of "flexible readiness" or increased use of flight simulators to enhance proficiency training without employing expensive field training.

c. Any future VP squadron cutbacks should be done at a slow process over a minimum of a five year period. A more rapid modernization of VP reserve squadrons would not be achievable and desirable because: (1) existing reserve training facilities cannot support a rapid transition rate; (2) integrated logistic support requires a minimum of 2-3 years lead time to upgrade reserve air stations to P-3C intermediate maintenance capability; and (3) rapid downsizing might negatively affect the careers, benefits and vitality of those individuals tied to the success of the VP organization.

d. Given the magnitude of the Navy's and DOD's proposed VP cuts, the pool of potential prior-service inductees into the reserves will be drastically drawn down. This would result in an increase in full-time TAR personnel to augment reserve squadrons, which equates to higher training costs and base operating support costs. As a partial solution, DOD can encourage individuals to fill critical SELRES positions by revising current reenlistment contracts for the active forces. For example, a two-year ready reserve obligation (to be served as a SELRES) could become a standard clause in reenlistment contracts.

2. For Future Research

a. The cost model presented in this thesis ignores certain elements of cost associated with the possible activation or deactivation of VP squadrons as part of large force mix changes. Future research in the areas of (1) costs associated with construction of new facilities or disposal of existing facilities; (2) increased recruiting and training costs to support a new squadron; and (3) active squadron shutdown costs, such as the transportation of personnel and equipment and the deactivation (mothballing) of equipment - will provide the complete cost analysis needed for "best mix" policy decisions.

b. With the reduced Soviet threat and longer warning times, an alternative to the maintenance of large VP active/reserve forces might be the implementation of a "flexible readiness" system. Future research should explore the feasibility of keeping forward deployed active forces at a high state of readiness, but sustaining reserve squadrons at a lower adjusted readiness level.

c. Researchers should look into the cost effectiveness of launching a major program to invest in P-3 flight and weapon system trainers (WSTs) to permit enhanced proficiency training without employing expensive field training (reduced operational tempos). Particular emphasis should be placed on training systems that can help alleviate the unique training problems faced by P-3 reserve component units. "Steps to assure the portability of training software and interoperability of training simulators will reduce costs further, despite relatively high initial investment costs [Ref. 48:p. 38]."

d. For the latest detailed information useful for estimating the various elements of cost asssociated with changes to the Active and Reserve force structure, refer to John Schank's newest reference handbook entitled *Cost*

Element Handbook for Estimating Active and Reserve Costs [Ref. 50]. This reference book provides the cost analyst with an invaluable section on how and where to obtain Navy cost data, and the Navy offices to contact to obtain further information.

The cost analysis described in this thesis has represented a more thorough and up-to-date quantification of the comparable costs of active and reserve P-3 squadrons. The resulting cost estimates have been based on the current P-3 force structure, and may be used for small changes in the current force mix. However, it will not totally suffice as a basis for adequately addressing the cost implications of large force mix decisions such as those presented in Figure 2. Nevertheless, the inherently lower costs of part-time personnel and lower operating tempo of P-3 reserve squadrons ensure that operating and support cost savings will result when reserve VP squadrons replace active ones.

APPENDIX: GLOSSARY

ACDUTRA	Active Duty for Training, also termed Annual Active Duty
ACTIVE	Military Personnel who are employed full-time by the United States Armed Forces
ADDITIONAL DRILLS	Additional drills beyond required drills used in order to increase the operating tempo of a reserve unit
DRILL	One four-hour period of reserve training; 48 required drills per year
FLIGHT-RATED	Personnel who qualify for aviation incentive pay
FRS	Fleet Replacement Squadrons which train newly winged pilots in specific aircraft type to replenish to fleet squadrons
IRR	Individual Ready Reserve - Reservists who have a military obligation but are not in a drill pay status
NFO	Naval Flight Officer, a flight-rated Officer who operates flight and weapon systems in Naval aircraft
NON FLIGHT-RATED	Personnel who are not in a flying status
O&S	Annual recurring operating and support costs
PAA	Primary Authorized Aircraft
RIF	Reduction in Force
SELRES	Selected Reservist - a member of the Ready Reserve in a drill pay state; works only part-time - for the Armed Forces

SPECIAL ACDUTRA (SPECACDUTRA)	ACDUTRA performed in excess of annual ACDUTRA; usually granted to provide additional training
STANDBY RESERVE	Personnel who are not required to perform drills but desire to maintain their military affiliation and have skills which will be required at mobilization, or Reservists who have been designated as key federal employees
TAR	Active Reserve personnel assigned to administer the Reserve program
USN	United States Navy; regular Naval forces
USNR	United States Naval Reserve; Naval reserve forces

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Thesis
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c.1 Comparative cost analysis of P-3 active and reserve aviation forces.

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